ENGINEERING NEWS-RECORD

APRIL 18, 1946

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Construction Costs Number

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Volume 136 • Number 16

APRIL 18, 1946

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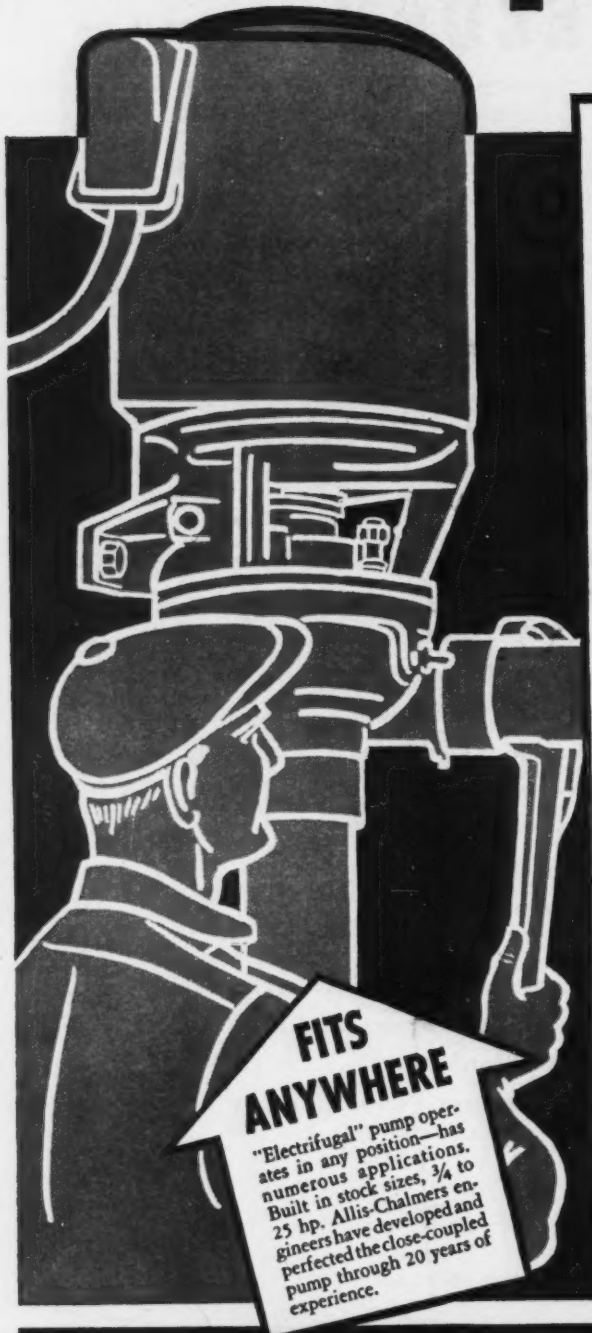
Number of copies of this issue printed 43,360

Hook Up...AND Pump!



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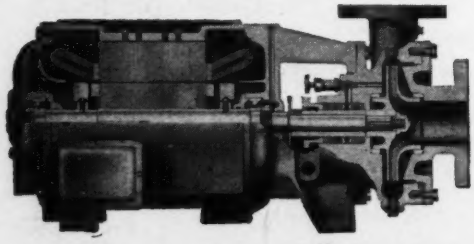

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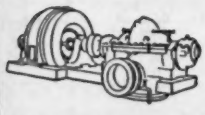

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Construction Trends

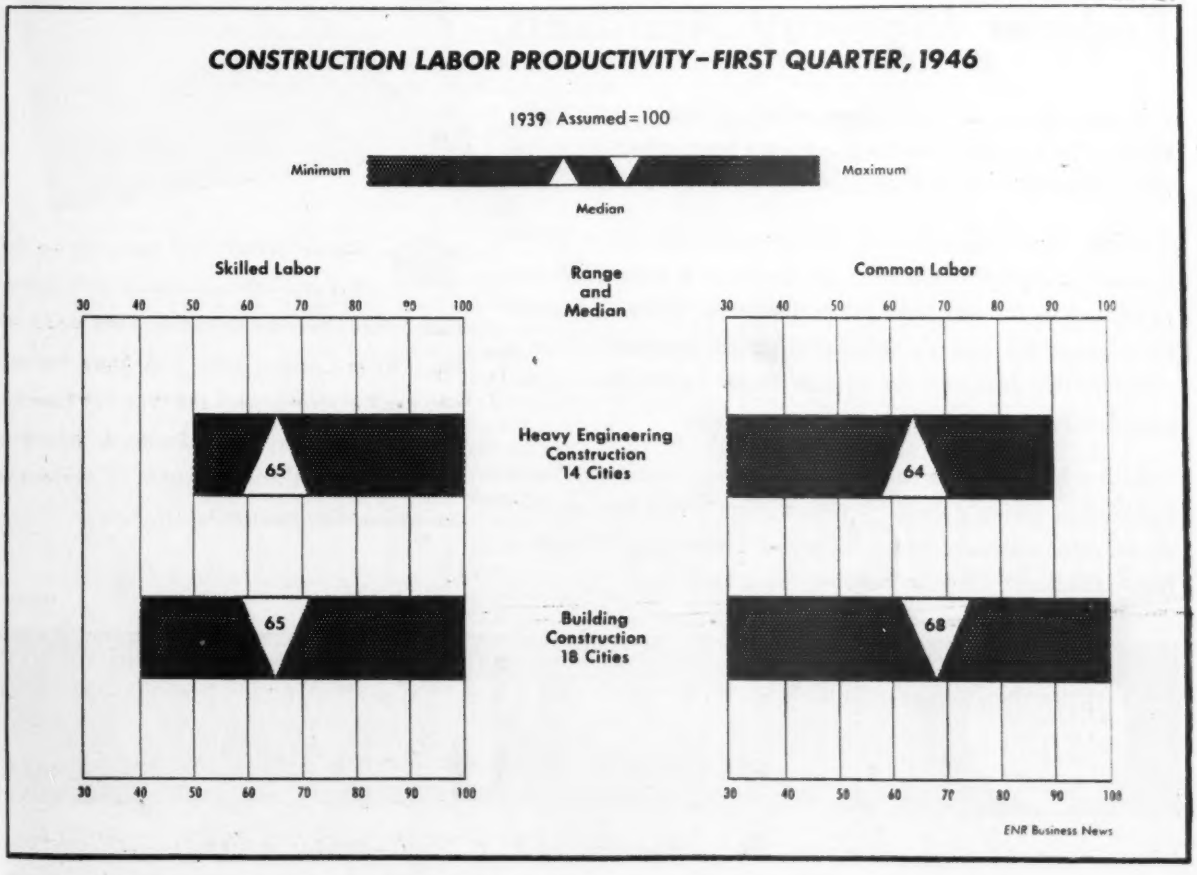
Labor Productivity on Construction

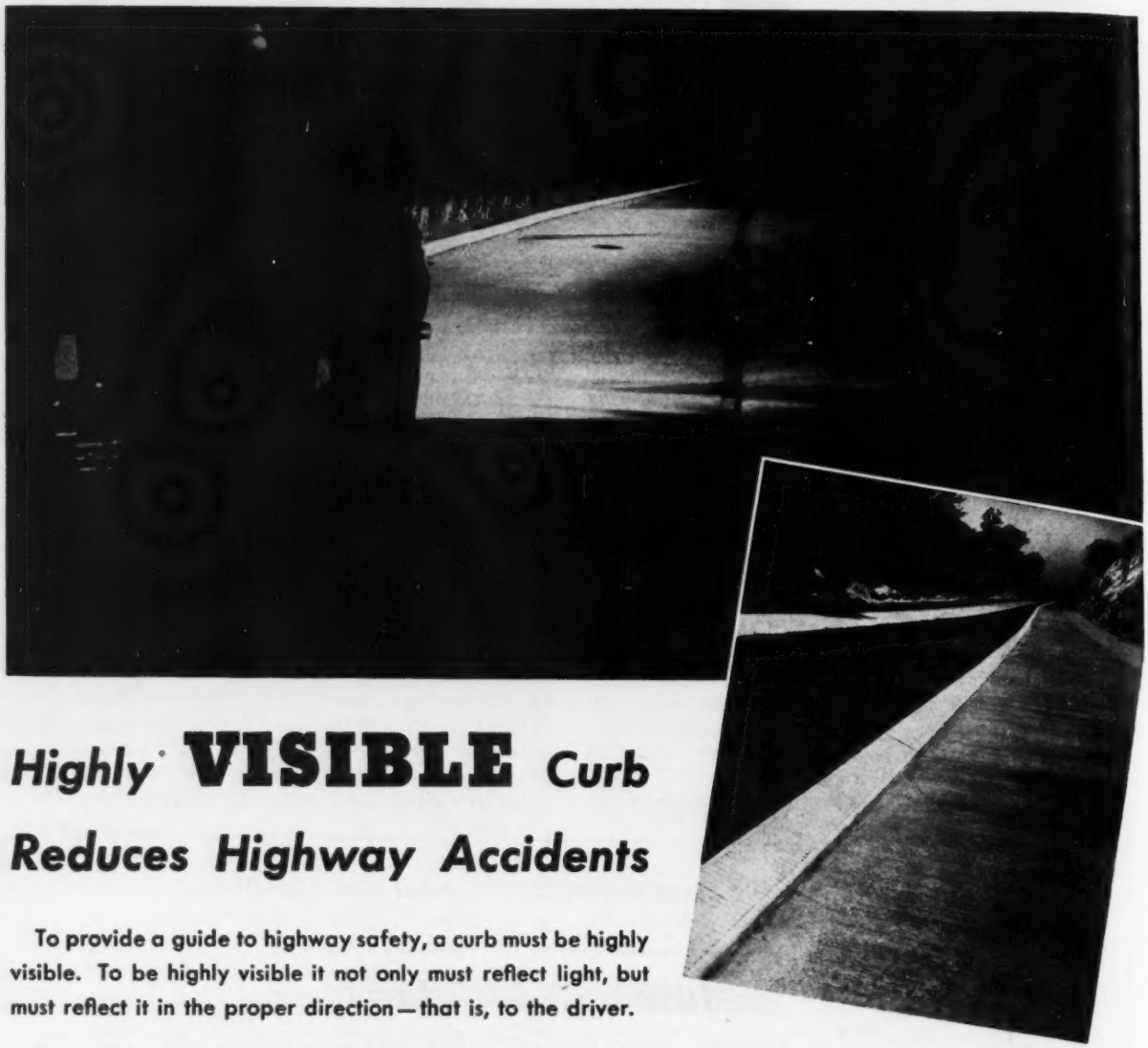
A means of measuring changes in construction labor efficiency has long been needed. In this issue *Engineering News-Record* reports on the results of the first effort to set up such a measure. The base chosen is 1939 = 100, and labor productivities experienced in the first quarter of 1946 are reported in relation to this base.

Cooperating in this study are 22 heavy construction contractors working in areas centering in 14-cities, and 54 building construction contractors working in areas centering in 18-cities. As typical of their comments, a Philadelphia heavy construction contractor reported skilled labor productivity at 65 and common labor at 60 percent of 1939, but stated that, in his opinion, percentages of "attainable efficiency" were 52 and 48. A Birmingham contractor reported that his 60 percent skilled and 50 percent common labor productivities would be reduced to about 25 percent if strikes were taken into account. And a Los Angeles contractor contrasted his grading work, going ahead at "equipment capacity", with his carpenters, steelworkers, laborers who operate at 60 percent of 1939 productivity.

On heavy construction, skilled labor productivity ranged from a minimum of 50 in Birmingham, St. Louis, Dallas and San Francisco, to a maximum of 100 in Los Angeles, all based on 1939 = 100. The 14-cities median is 65. Common labor productivity as reported ranged from a minimum of 30 in Detroit, for one class of workers and from minimums of 50 in Birmingham, Cincinnati, Dallas and Seattle to a maximum of 90 in Detroit. The 14-cities median for common labor efficiency is 64.

On building construction, the 18-cities median is 65 for skilled and 68 for common labor productivity as reported in the first quarter. On page 99 of this issue are presented details of the study by areas for building construction. Also reported there is a formula for computing changes in labor productivity and reasons for current efficiencies.





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News of the Week

ENGINEERING NEWS-RECORD • APRIL 18, 1946 • VOLUME 136 • NUMBER 16

$2 billion program begun on Missouri River Basin

Reclamation awards $4,688,000 contract for Kortes Dam and prepares to start Angostura and Boysen Dams—Army begins Garrison, Kanopolis, Kansas City work

Both the Bureau of Reclamation and the U. S. Army Engineers have launched their huge construction programs for the Missouri Valley.

When Congress passed the 1944 Flood Control act (*ENR* Dec. 7, 1944, vol. p. 715) it authorized $200,000,000 for each agency for construction in the Missouri basin, and this work is now starting.

The combined overall program of both organizations (known as the Pick-Sloan plan) is expected to cost about two billion dollars. It calls for construction of more than 100 new dams to create reservoirs, 150 irrigation projects to supply water for over 5,000,000 acres, about 20 power plants, improved water supplies for at least 19 communities, hundreds of miles of flood control dikes and levees, and 760 mi. of improved river channel for navigation. (*ENR* Dec. 14, 1944, vol. p. 757).

The bureau began its construction program April 14 when Secretary of Interior Krug announced the award to Morrison-Knudsen Co., Boise, Idaho, of a $4,688,000 contract for constructing Kortes Dam and hydro-electric plant, on the North Platte River 60 miles southwest of Casper, Wyo. The work is scheduled to start in 30 days and the contractor is allowed three years to complete the project.

Kortes Dam a power project

Kortes Dam is planned for the production of power only. It will be located two miles below the Seminoe Dam—completed by the bureau in 1938 to irrigate 66,000 acres. Energy generated at Kortes Dam will be used to help relieve a threatened power shortage in the area and for development of coal, oil, and mineral resources. Located at the toe of the dam, the power plant will have a 36,000-kw. generating capacity provided by three 12,000 kw. generators. Contracts for generators and other electrical equipment are to be awarded later.

The new plant will be part of an integrated power network to permit the firm power output of the Seminoe and Kortes plants to be increased by 120 percent. To deliver this power, the bureau plans to replace the 69-kilovolt transmission line from Seminoe to Casper, Wyo., with a 115-kilovolt line. Another 115-kilovolt line is scheduled for construction from Casper, Wyo., to Sidney, Neb.

Congress also appropriated funds for construction by the bureau of Angostura Dam on the Cheyenne River near Hot Springs, S. D., and Boysen Dam on the Big Horn River near Thermopolis, Wyo. Both of these projects are to be started soon. The Angostura unit provides water for irrigating 16,000 acres of land, while Boysen will embrace irrigation, power generation, flood control and silt detention.

Army starts Garrison Dam

Preliminary construction at Garrison Dam, which is located on the Missouri near the town of Garrison, N. D., and is estimated to cost about $161,000,000, has been started by the Army Engineers.

This progress was explained before the House Flood Control Committee in Washington April 11 by Maj. Gen. Lewis A. Pick, division engineer for the Missouri River Division.

General Pick also told members of the committee that the Western Con-

(*Continued on p. 72*)

Must pay N. Y. for Niagara water use

On April 11, Nathaniel Goldstein, New York State attorney general, announced an agreement between the state and the Niagara Falls Power Co., under which the company will pay the state for the use of the water it diverts from the Niagara River for power-generation.

The agreement provides for an annual rental payment of $1,100,000 for 20,000 cfs. for a 12-yr. term from July 1, 1943, and prohibits the company from passing on any part of this charge to its customers.

This settlement marks the close of a long controversy between the state and private power interests, the sequence of events in the matter in recent years being as follows:

On Dec. 10, 1942, the New York State Court of Appeals unanimously rejected the contention of the state's Water Power and Control Commission that the legislative grants under which the Niagara Falls Power Co. diverts water from the Niagara River for power purposes were unconstitutional (*ENR* Dec. 24, 1942, vol. p. 887). However, the court at that time said that it "made no determination as to the state's reserved right to control, regulate or license, through appropriate legislation, the diversion of water from the Niagara River near Niagara Falls."

Subsequently, the New York State legislature passed an act to control the use of Niagara River water for power, under which the state has the right to license and control the amount of water used by the Niagara Power Co. for power-producing purposes (*ENR* March 4, 1943, vol. p. 328).

The power company sought to have the law invalidated, but on Sept. 19, 1945, its constitutionality was upheld by a decision of Justice Francis Bergan of the State Supreme Court (*ENR* Sept. 27, 1945, vol. p. 407). The new agreement was based on that decision, and in it the company binds itself not to appeal Justice Bergan's decision and judgment.

Arrears due the state from July 1, 1943, when the new water-control law became effective, are payable within one month and amount to about $2,000,000.

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Highways—On July 1, *Virginia's* highway department will begin to spend a $16,000,000 fund for improvements to secondary roads. . . . *Arizona* reported that more than $2,660,000 worth of highway building and improvement projects are now under way. . . . *Pennsylvania's* $10,000,000 rural road improvement program will be initiated in three weeks. . . . *Louisiana* planned spending a total of $6,700,000 on its primary roads. . . . In view of rising material and labor costs, *Minnesota's* highway program will be cut by about one-third, state officials said. . . . *Florida's* road department approved plans for a bridge over the Perdio River, 18 miles northwest of *Pensacola*. . . . *New Jersey* appropriated $33,567,000 for highways, with $5,775,000 allotted to townships for road work.

Hospitals, School Buildings—A $1,000,000 hospital is planned for *Columbus, Ga.* . . . *Virginia* now has $9,000,000 available for additions and improvements to state mental hospitals. . . . *Iowa* authorized a $10,000,000 building program for educational institutions, state hospitals and juvenile institutions. . . . Shortages of materials are delaying some $40,000,000 in school construction in *Oregon*. . . . Improvements and new construction totalling $2,000,000 have been authorized for a veterans' hospital at *Alexandria, La.*

Housing—After standing as a steel skeleton on *Chicago's* South Side for the past 15 years, a 10-story building at 6900 Cranden Ave. will be finished, remodelled as a 154-family apartment building. . . . The University of Illinois said it had been allotted additional housing for 108 married students at its campus at *Urbana*. . . . Mayo Properties Assn. began construction of 220 prefabs for use of "fellows" at the Mayo Foundation School at *Rochester, Minn.*

Bond Issues—*Seattle, Wash.*, voters approved a $10,000,000 issue to finance construction of three junior high schools and additions to existing school buildings. . . . *Turon, Kan.*, will vote on a $70,000 sewer-system improvement bond. . . . *Avon Lake, Circleville* and *Martins Ferry, Ohio*, will vote May 7 on bond issues totalling $2,000,000 for civic improvements. . . . *Walker County, Ga.*, will vote May 3 on $675,000 in bonds to finance road improvements. . . . *Alexandria, La.*, will vote May 14 on a $3,000,000 issue to cover cost of drainage, street grade separations and city buildings. . . . *Columbia, S. C.*, will vote on a $2,000,000 issue for school improvements. . . . Fifteen *New Mexico* communities recently approved bond issues of more than $3,000,000. Biggest issue was $720,000 at *Albuquerque*, to finance a civic auditorium and sanitary sewers.

Water Supply—*Garnett, Kan.*, prepared plans for improvements to include a water softener and an increase in plant capacity to 1 mgd. . . . *North Conway, N. H.*, will spend $175,000 to expand its present water system.

Miscellany—A few days after the federal government received possession of land, ground was broken for the $4,000,000 Olentangy Dam, north of *Delaware, Ohio*. . . . *Pensacola, Fla.*, considered plans for a million-dollar development of its port facilities. . . . *Little Rock, Ark.*, city officials checked over a Chamber of Commerce plan for a $1,500,000 improvement program for the city airport. . . . Railroad interests at *Phoenix, Ariz.*, inaugurated a $500,000 program to increase freight-handling capacity of railroad yards there.

Incinerator contract approved by Los Angeles

On April 8, Mayor Fletcher Bowron of Los Angeles, Calif., signed the ordinance recently passed by the city council authorizing design and construction of a long-proposed rotary type rubbish incinerator for that city, but 30 days will elapse before formal award of the contract on May 8. Meantime the contractor is expected to proceed with design and other preparatory work.

The contractor is to build the incinerator in return for monthly rental payments of $7,479 for a 108-month period, after which the city may purchase the incinerator for $32,605, making the overall cost to the city $840,441, of which $220,441, is financing charges. It is estimated that revenues, beyond operation costs, will cover the city's obligations to the contractor, the Griffith Co. Harry O. Duerr has contracted to operate the plant on a sliding scale basis.

The new incinerator is to be erected on city-owned property at East 26th St. and the Los Angeles River. It is to be ready for operation within a year. The capacity is to be 20 tons per hour.

The new incinerator contract is planned as a solution to a municipal refuse disposal problem existing since 1937, when a previous plant became unusable, and Los Angeles voters refused to approve bonds for construction of a new one to take its place.

New technical library for Kansas City, Mo.

Engineers, scientists and students in the Kansas City area are soon to have made available to them the facilities of an unusually well equipped library of technology and science.

Under the will of the late Herbert F. Hall, wealthy grain man, a trust fund of $6,000,000 was set up to create and endow a library specializing in the basic sciences and technology, to be named the Linda S. Hall Library in memory of his wife. The trustees were given authority to determine the location, size and scope of the library, but Mr. Hall specified that there shall be maintained at all time an endowment fund of not less than $2,000,000.

For the present, the trustees plan to use for the library the Hall residence near the campus of the University of Kansas City. It is a 3-story brick building of sufficient size to be adequate for some years. For several months past the work of organizing the library and acquiring books has been going forward under the direction of Joseph C. Shipman, who has been named librarian.

Mr. Shipman estimates that the present building will have a capacity of 30,000 to 35,000 volumes. When it exceeds this size, provisions of the trust will permit the erection of a new library.

Calendar of Meetings

NATIONAL

American Wood Preservers' Association, 42nd annual meeting, Netherlands Plaza Hotel, Cincinnati, Ohio, April 23-25.

President's Highway Safety Conference, Washington, D. C., May 8-10.

REGIONAL

Wisconsin Section, American Society of Civil Engineers, Milwaukee, Wis., April 25.

Florida Engineering Society, 13th annual meeting, Jacksonville, Fla., April 25-27.

New England Sewage Works Association, Pickwick Arms Hotel, Greenwich, Conn., May 17.

Pacific Northwest Sewage Works Association, Gearhart Hotel, Gearhart, Ore., May 22.

Pacific Northwest Section, American Water Works Association, Gearhart Hotel, Gearhart, Ore., May 23-24.

New York State Sewage Works Association, spring meeting, Hotel Hamilton, Utica, N. Y., May 24-25.

Power, irrigation water shortage seen in Arizona surveys of federal agencies

Lake Mead near all-time low at 18,000,000 ac. ft.—Stored water in state seen low for crop-growing season

Because of low stream flows, depleted reservoir storage and overdrafts on the groundwater supplies, central Arizona is facing a severe shortage of water for irrigation during the coming growing season, according to the U. S. Geological Survey. A power shortage also is in prospect for Arizona, the Bureau of Reclamation states, due to the combination of these conditions and the depletion of storage behind Boulder Dam to produce power for war industries.

Greatly subnormal flows were prevalent throughout Arizona during March, especially in the Gila and Salt River basins, where streams were approaching record-low flows for the season. Totals for March ranged from 16 percent of normal in Verde River to 31 percent in the Salt River at Roosevelt Dam. The flow of the Gila River averaged 27 percent of normal; since 1921 in only two years has the March runoff been lower.

March and April are the months when the larger rivers in southern Arizona reach their maximum volume, but the flows this year have been disappointing. With snow supplies at high altitudes extremely deficient, there is little likelihood of much improvement in stream discharge. Hence, unless there is copious summer rainfall, subnormal runoff for the year appears imminent.

The Soil Conservation service reports that as of March 15, general snow cover on the major watersheds of the state equaled or approached the all-time low for the period of snow-survey records. The average of the Gila River watershed was very low, while conditions on Salt River watershed are only slightly better. General snow cover and soil-moisture conditions on the Little Colorado and Bill Williams rivers are below normal.

Storage conditions reflect the below-normal flow of the rivers in Arizona during the greater part of the past three years. San Carlos reservoir on Gila River, which was nearly emptied last year, has continued in that depleted condition. A year ago the reservoir contained 120,000 acre-ft., of which most was holdover from 1941-42. However, the 1941-42 recharge is now exhausted and no replenishment occurred during the past two months. Consequently, San Carlos reservoir can provide no significant amount of water for irrigation needs this summer.

Storage in the Salt River reservoir system has also been decreasing since 1941-42, but generally not so rapidly as in the San Carlos. However, the storage picture has deteriorated rapidly during the past two months. In January, the reservoirs of the Salt River system (including Bartlett and the new Horseshoe reservoir on the Verde River) held 741,600 acre-ft. as against a normal of 634,300 acre-ft. Drafts to augment the low stream flow were made during February and March, normally the season of refilling, so that storage at present aggregates 656,600 acre-ft. in comparison with a normal of 845,600 acre-ft. This storage is probably sufficient for this year's irrigation needs, but the prospects for holdover reserves for next year are quite adverse, unless effective conservation is practiced this season.

Boulder Dam storage drops

Lake Mead has been receding year by year since the wet year of 1941 when it spilled with a maximum content of 27,790,000 acre-ft. At present about 18,000,000 acre-ft. is in the reservoir, the lowest at this season since 1941.

The flow into Lake Mead increased from 57 percent of normal in 1940 to 132 percent of normal in 1941 and 1942. Since then it has ranged close to normal with a tendency toward subnormal rates in recent months. The flow since October, 1945, has totaled 95 percent of normal. Deficient snowfall throughout the basin this past winter foreshadows runoff substantially below normal this spring and summer.

The Bureau of Reclamation states that the storage in Lake Mead has been allowed to drop since 1941 because of the high power demand for the war effort. Irrigation demands also were slightly greater than during the pre-war years.

Power production at Boulder Dam by contract years, which begins June 1, has been as follows:

Year	Millions of kilowatt hours
1940-1941	3108
1941-1942	3259
1942-1943	5104
1943-1944	6251
1944-1945	5949
1945-1946 (Estimated)	4890

The present outlook is that Boulder generation will be limited to firm energy of 4,251 million kwh. for the contract year June, 1946-May, 1947.

Since there is no regulatory storage between Boulder and Parker Dam, the generation at Parker will be reduced in proportion to the reduction in generation at Boulder, according to the bureau. The reduction in Parker generation, the reduction in generation by Salt River plants, and the increased use of power for irrigation pumping will result in a power shortage in Arizona, the bureau concludes.

Ground water is drawn down

Deficiencies in surface water in the Gila and Salt River basins are being supplemented so far as possible by "mining" of the underground supplies, the Geological Survey states. There has been little or no recharge to groundwater reservoirs. Many shallow domestic wells have failed in central and southern Arizona, and greatly increased pumping has been started several months earlier than usual. However, ground-water conditions in the Salt River valley are not critical because it is a wide basin, but conditions will be critical by late summer in narrow basins along upper Gila and Santa Cruz rivers unless there are heavy summer rains.

Plan $1 million gas line serving Mississippi towns

Plans for the construction of a $1,200,000 natural gas pipeline to serve nine towns in the Jackson, Miss., trade area, have been approved by the United Gas Corp. and the United Gas Pipe Line Co.

The joint announcement was made following completion of five months of negotiations with the towns.

United Gas Corp. will build distribution systems within the towns of Brandon, Pelahatchie, Morton, Forest, Newton, Lake, Decatur, Union and Philadelphia. The United Gas Pipe Line Co. will construct 86 miles of pipeline to connect the towns with suburban areas.

Plans call for a main 6-in. line to be built from a compressor station near Jackson in a general easterly direction ending at Philadelphia, Miss.

E. L. Worthington named W. Va. highways chief

E. L. Worthington, state maintenance engineer since 1938, has become commissioner of the West Virginia State Highway Commission, succeeding E. L. Bailey, who resigned recently.

Mr. Worthington, a native of Maryland, attended Johns Hopkins University, is a veteran of the first World War and, before joining the West Virginia Commission in 1922, had been affiliated with the testing laboratory of the North Carolina State Highway and Public Works Department, and had served as Maintenance Inspector for the Maryland State Road Commission.

Mr. Bailey, who had been reappointed for a 4-year term in June, 1945, said his retirement was dictated by the need for his attention to private business interests.

New S. F. building code to be offered soon

A new building code is expected to be presented to the San Francisco, Calif., board of supervisors soon for enactment into law. This code will replace the existing one which has been in effect with but minor revisions since 1909.

Comments by various local organizations representing architects, contractors, materials men, civil engineers, and structural engineers, were invited and were submitted to the city on April 4. The San Francisco section of ASCE, one of the reporting organizations, recommended that a board of review be set up to make bi-annual reports as to the success of the code, together with recommended revisions, and that a readoption with revisions be affected every two years. The report submitted to the city by the Structural Engineers' Association of Northern California included recommended changes in the earthquake provisions of the proposed code and also suggested that additional time be provided for preparation and review.

The proposed code will now be revised by the city engineers as the result of comment by the organizations and it will then be presented to the supervisors.

Codes discussed in Minnesota

Building codes, originally designed to protect homeowners, are now too restrictive and are impeding progress in the construction field, speakers at a 3-day institute on Techniques of Home Building at the University of Minnesota said last week.

"The construction industry is suffering from outmoded building codes," Harold S. Starin, Duluth architect, told the session. "In many places, the building code itself is the principal deterrent to construction. As now written, the codes restrict the use of smaller wood units, light metals and plastics."

He and other speakers advocated large scale revisions of existing codes to speed construction.

Big contracts to be let on Columbia Basin work

Contracts aggregating $40,000,000 are to be awarded before July 1 for work on the Columbia Basin irrigation project in south central Washington, according to Frank Banks, supervising engineer for the project.

Morrison-Knudsen Co., Inc., of Boise, Idaho, submitted a low bid of $619,000 March 20 for the first unit of the main canal. Bids for the second phase of construction will be opened April 15.

Organize group to study column design problems

To seek solutions to the problems relating to the design and behavior of structural compression members, a national forum has been organized under the name of Column Research Council of the Engineering Foundation. Headquarters of the new council will be at 101 Park Avenue, New York City.

The organizers believe existing data is inadequate, and point to confusion in use of column formulas under contemporary specifications. In the interest of standardization, economy and public safety, they said, there is a need to remedy the situation by agreement among specification-writing bodies. A research program is being formulated.

Among the organizations participating in formation of the council are: American Society of Civil Engineers, Association of American Railroads, the Engineering Institute of Canada, the American Institute of Steel Construction, American Institute of Architects, American Society of Mechanical Engineers, Society of Naval Architects and Marine Engineers, the Public Roads Administration, National Bureau of Standards, and representatives of interested subdivisions of the Army and Navy.

Shortridge Hardesty, New York consulting engineer, is chairman of the newly-organized council.

Government agencies start Missouri Valley work

(*Continued from p. 69*)

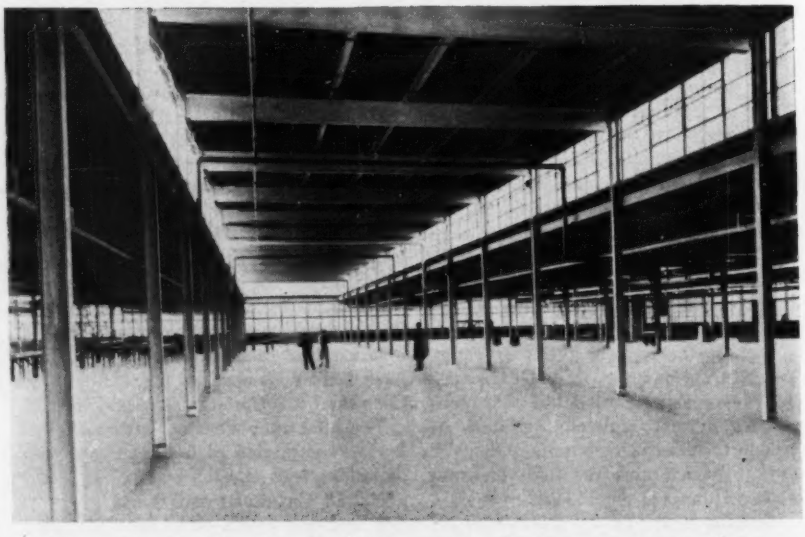
struction Co., Sioux City, Ia., had received a $4,142,832 contract for completing Kanopolis Dam on the Smoky Hill River in Kansas, and that work has been started at Kansas City, Mo., on a big floodwall project and part of the Missouri Valley program. L. G. Barcus and Co., Kansas City, was low bidder at $711,900 for the floodwall project when bids were opened Feb. 14, and ground has now been broken on this job.

If the Appropriation Bill for the fiscal year 1947 is finally approved as passed by the Senate recently (*ENR* March 28, vol. p. 443) it will be possible for the Army Engineers to start work on the Cherry Creek Dam at Denver, Colo.; the Fort Randall Dam in South Dakota, and the Harlan County Dam in Nebraska.

The contract for the access railroad at Garrison Dam went to the William A. Smith Construction Co., Inc., of Houston, Tex., at $398,215.45. This contract probably will be underway before June 1.

A bid of $1,156,644.45 by S. J. Groves and Son, was low for the construction of access roads at Garrison.

Bids for construction of the first section of the construction town at Garrison Dam will be opened about May 17.



One-story plant provides space for easy operation

Large expanses of windows and one-story construction to provide better working conditions are features of a new plant built at Trenton, N. J., for the Reynolds Spring Co., automobile accessory manufacturer.

The plant is of steel frame, has an insulated steel roof deck, steel sash, brick walls and concrete floors. Except for the office section, there is no parapet above the window sash—sash being carried up to the eaves without a band of masonry at the top—to give a maximum of light.

Engineering and erection was done by Walter Kidde Constructors, Inc., of New York City.

Doubt Ontario engineers' wage status

The collective bargaining status of employees in the province of Ontario who are registered professional engineers was brought into question by a recent decision of the Ontario Labor Relations Board.

The Ontario Board found that rulings of the Wartime Labor Relations Board (National) with respect to professional men had so confused the issue that it could not determine whether engineers in professional work in Ontario can organize and bargain collectively with their employers. Consequently, it dismissed the suit before it in the hope that the matter thus would be brought before the national board for a final decision.

The case before the Ontario board was a petition brought by Unit No. 1, Toronto Hydro-Electric System, of the Federation of Employee-Professional Engineers and Assistants for certification as the collective bargaining agent for engineers of the Toronto Hydro-Electric System. The federation was organized in the fall of 1944 (*ENR*, Nov. 16, 1944, vol. p. 605) under the auspices of the Association of Professional Engineers of Ontario in order to provide engineering employees in that province with an agency for collective bargaining at the professional level.

Concurrently, the engineers of the whole dominion, under the leadership of the Engineering Institute of Canada, were endeavoring to determine what their status should be under the recently adopted Wartime Labor Relations Regulations. As a first step, they applied to the Wartime Labor Relations Board for temporary exemption from the provisions of the Wartime Labor Relation Regulations to give them time to make up their minds as to what status, if any, to seek under that act (*ENR*, Dec. 21, 1944, vol. p. 788). In granting the temporary exemption the board said, "For the purposes of the regulations, persons employed in a professional capacity shall be deemed to be employed in a confidential capacity" which latter type of employee was exempt from the provisions of the act. Subsequently, the engineers decided to ask for a separate code, (*ENR*, Jan. 25, 1945, vol. p. 102) but this was denied by the National Board. Instead, the National Board ruled that professional workers in any plant or company would not be grouped with other workers in union representation but would be permitted to set up their own collective bargaining group with their own representation.

The Ontario board, in its decision, said: "We wish to record our unanimous opinion that persons employed in a professional capacity, unless they come within the categories of persons expressly excluded from the provisions of the legislation, should have the same opportunity to organize and bargain collectively as is now enjoyed by other persons under the regulations." The board went on to say, however, that it could find no evidence that the national board had revoked its resolution of April 12, 1944, holding that persons employed in a professional capacity shall be deemed to be employed in a confidential capacity. In view of this confusion, the board concluded that it should dismiss the petition "so that the matter may be brought before the national board, whose final decision alone can clear the air."

Approve Delaware water diversion for Philadelphia

On April 6 the Interstate Commission on the Delaware River Basin announced that a proposed diversion of 500,000,000 gpd. from the Delaware River at Wallpack Bend for the future water supply of Philadelphia, Pa. "would be fair and equitable in respect to the interests of all the states" in which the river watershed is located. These states include: New York, New Jersey, Pennsylvania and Delaware.

Army Engineers to start ten more VA hospitals

The Veterans Administration April 9 requested Army Engineers to make field surveys preparatory to constructing ten more veterans hospitals.

Previously, the Army had been asked to make studies of nine other new VA hospitals or additions (*ENR* April 11, vol. p. 511). These projects are located at San Fernando, Calif.; Brooklyn and Buffalo, N. Y.; Newark, N. J.; Louisville, Ky.; Atlanta, Ga., and Alexandria, La.

The ten additional hospitals are:

Location	Beds	Appropriated Funds
Decatur, Ill.	250	$2,768,258
Kansas City, Mo.	495	3,805,762
Kansas City, Mo.	250	2,418,058
Seattle, Wash.	300	3,351,216
Miles City, Mont.	100	1,050,312
Big Spring, Tex.	250	2,570,753
Shreveport, La.	450	3,715,361
Iron Mountain, Mich.	250	2,555,037
Fresno, Calif.	250	2,634,676
Wilkes-Barre, Pa.	475	3,703,063

All of the projects listed above, with the exception of the 250-bed project at Kansas City, will be general medical and surgical hospitals. The larger development at Kansas City will be constructed on a foundation designed for a 750-bed structure to permit enlargement in the future if this is desired. The smaller hospital at Kansas City will be built on the same site as the larger structure but will be an entirely separate hospital unit, VA officials said.

Canada plans $1 billion highway building work

Heavy building programs for highways and bridges totalling over a billion dollars have been recorded, W. S. Anderson, Minister of Public Works for New Brunswick, told members of the Canadian Good Roads Association at a 3-day annual meeting at Quebec recently.

Mr. Anderson said that reports indicated that large budgets of plans for early undertaking have already been made, as Dominion road officials seek means to cope with predicted rapidly increasing motor vehicle registration in Canada. Other reports indicated that the present total dominion automobile registration of about 1,500,000 cars will pass two million in ten years.

Other speakers at the meeting included Charles H. Sells, superintendent of the New York State Public Works Department, who discussed the "Place of Highway Systems in future Transportation Systems"; H. A. Gibeau, director of Public Works for Montreal, who said his city paid four-tenths of a cent per cubic foot last winter for snow haulage.

Mr. Anderson was elected president.

Chattahoochee River dam recommended by engineers

Three recommendations concerning the development of the Chattahoochee River in Georgia for flood control, electric power, water regulation, and navigation have been forwarded to the River and Harbors Board at Washington, D. C., by Brig. Gen. James B. Newman, Jr., South Atlantic Division Engineer at Atlanta, Ga.

The recommendations include one for the construction of a $17,631,000 dam at Buford, which would make a lake 50 miles long, cover 34,300 acres, with a shore line of 500 miles. This dam would protect Atlanta's water supply and increase the minimum flow of the river at Atlanta to 1,634 cfs.

The other items in the report ask for construction of a 9-ft. channel from the Gulf of Mexico to Columbus, Ga., in place of the 6-ft. channel previously recommended, and a navigation channel of similar depth on the Flint River as far north as Bainbridge, Ga., instead of the originally-planned 6-ft. channel.

Concerning the 9-ft. navigation channel, the report calls for a high dam at Fort Benning, to cost about $6,954,000.

Chicago announces 7-yr. construction program

Mayor and city council's finance committee approve a total expenditure of $298,600,000 for essential projects.

Results of several months of intensive study by the Engineering Board of Review, Chicago, are embodied in a 7-year construction program for that city, announced Mar. 28 by Mayor Edward J. Kelly and approved by the finance committee of the city council. Totaling $298,600,000, the program includes those projects deemed essential to the city's initial peacetime improvement plan. The amount of funds required for the various civic improvements has been estimated for each of the years from 1946 to 1952, as indicated in the accompanying table.

Selection of each improvement project recommended by the board was based on the following prime considerations: (1) Is the improvement needed as a public benefit? (2) Will it conform generally to the master plan of the Chicago Plan Commission? (3) Is it needed now or can it be deferred until some future date when public construction may be desirable as an employment pool? (4) Does the improvement conflict seriously with priorities for housing materials? (5) Will the cost of the improvement be commensurate with the benefits to be derived; and (6) Is its financing feasible within the scope of an annual debt requirement which is not unreasonably burdensome?

Proposed bond issue

The financing program for this large civic improvement plan will be provided by $115,700,000 of new corporate bonds; $74,200,000 of revenue bonds; funds obtained under a previously authorized bond issue of $31,500,000; current revenues from motor fuel tax; and anticipated income from local transit and airport operations.

The $115,700,000 corporate bond issue will be submitted to a referendum vote of the people at a judicial election to be held in Chicago on June 3. Also scheduled to be voted on at that time is a $70,000,000 bond issue submitted by the Cook County Board for the county's share in the cost of superhighway construction in the Chicago area.

It is proposed that one-third of the $45,000,000 estimated cost of the new Chicago airport at the Douglas field site be borne by the city. The remaining $30,000,000 would be financed by revenues derived from airport fees and licenses, supplemented by state and federal aid.

CPA adds to list of construction offices

Recently the Civilian Production Administration announced a long list of additional offices set up to handle applications for non-housing construction covered by the new CPA Order No. 1, curtailing construction to assist the veterans housing program (*ENR* April 4, vol. p. 459). In *ENR* April 11, vol. p. 513, the addresses of the first district offices to be established were reported. To this list should be added the following:

Region I
Springfield, Mass.—1597 Main St.
Bangor, Maine—8 Harlow Street.
Manchester, Mass.—814 Elm St.
Providence, R. I.—75 Westminster.
Northfield, Vt.—42 Central St.

Region III
Grand Rapids, Mich.—2175 Lake Drive, S.E.

Region IV
Memphis, Tenn.—677 Shrine Bldg.
Columbia, S. C.—2065 Blossom St.
Birmingham, Ala.—4th Floor, Dixie Carlton Hotel, 3rd Ave. & 23rd St.
Jackson, Miss.—3951 Council Circle.

Region V
Springfield, Ill.—301 West Adams.

Region VI
Omaha, Neb.—2nd Floor, Arthur Bldg., 210 South 18th St.

Region VII
Tulsa, Okla.—1932 North Boston Ave.

Region VIII
Phoenix, Ariz.—108 Aluminum Plant Office Bldg., West Van Buren St.

Region IX
Seattle, Wash.—8306 18th St., N.W.
Spokane, Wash.—North 120 Wall St.
Portland, Ore.—210 Central Bldg.
Reno, Nev.—56 Boyd Place.
Helena, Mont.—P. O. Box 729.
Casper, Wyo.—845 South Beach St.

Region X
Fargo, No. Dak.—210 Walker Bldg.

In addition to the new offices, CPA has announced the following changes in post office addresses:

Region III
Toledo, Ohio—312 Summit St.
Louisville, Ky.—1222 Heyburn Bldg.

Region IV
Tampa, Fla.—311 Hinson Ave.
Miami, Fla.—35 N.W. Second St.

Region V
Milwaukee, Wis.—161 W. Wisconsin Ave.

Region VI
Little Rock, Ark.—City Health Center.

Region VII
Oklahoma City, Okla.—215 Colcord Building.
New Orleans, La.—1412 Masonic Temple Bldg.
Albuquerque, N. Mex.—Rosenwald Bldg.

Region VIII
Los Angeles, Calif.—117 West 9th St.
San Diego, Calif.—1600 Pacific Highway.

Region IX
Boise, Idaho—119 North 8th St.

San Francisco fails to O.K. Bay bridge survey

Completion of an engineering survey for a structure to supplement the present San Francisco-Oakland Bay bridge (*ENR* Apr. 11, vol. p. 525) was jeopardized last week when the San Francisco Board of Supervisors failed to vote their $37,000 share of the investigation's cost.

The survey was authorized last November when the California Toll Bridge Authority requested the state department of public works to consider all possibilities for another bridge. (*ENR* Nov. 15, 1945, vol. p. 643.) It was estimated that the comprehensive study would cost $115,000. The authority agreed to furnish $40,000, with San Francisco and Alameda counties expected to supply the balance, or $37,500 apiece.

It appeared that the San Francisco supervisors will not approve the required funds unless a proposed causeway paralleling the present bridge to the south is also considered, as well as a second bridge. The suggested causeway would be 2,000 ft. wide and would handle rail as well as motor traffic. Tubes on the Alameda side would take highways and the transcontinental tracks, now stopping in Oakland beneath a channel, to allow passage of shipping into the South Bay.

In the meantime, the state public works department is going ahead with the survey on available funds.

Expenditures Under the 7-year Public Works Program for Chicago†

* *Includes $10,000,000 of bridge construction* † *Thousands of dollars omitted*

Project	1946	1947	1948	1949	1950	1951	1952	Total
Streets and Alleys								
Construction	$6,000	$7,000	$7,000	$7,000	$5,000	$5,000	$5,000	$38,000
Maintenance	600	1,000	1,000	1,000	700	700	700	5,700
State Street Bridge	1,500	1,000	.....	.....	.....	.....	.....	2,500
Sewers	1,000	8,000	12,000	12,000	12,000	7,000	6,200	58,200
Airports (City's share)	3,000	6,000	12,000	12,000	12,000	.....	.....	45,000
Superhighways (City share)*	6,000	10,000	12,000	15,000	12,000	5,000	4,000	64,000
Bridges and Viaducts								
Construction	2,300	1,200	1,200	1,200	1,200	1,200	1,000	9,300
Maintenance	300	300	300	300	300	300	400	2,200
Street Lighting	2,000	1,000	1,000	1,000	1,000	1,000	1,000	8,000
Grade Separations	700	600	600	600	500	500	500	4,000
Waste Disposal Equipment	1,500	.....	.....	.....	.....	.....	.....	1,500
Garage and Repair shops	.....	500	.....	500	.....	.....	.....	1,000
West Side Subway	1,000	5,000	5,000	7,000	7,000	.....	.....	25,000
Washington St. Subway	.....	4,600	5,000	.....	.....	.....	.....	9,600
Jackson Blvd. Subway	.....	.....	.....	4,600	5,000	.....	.....	9,600
Playgrounds	.....	1,000	1,000	500	500	500	500	4,000
Slum Clearance	1,000	3,000	1,000	.....	.....	.....	.....	5,000
Police and Fire Bldgs.	300	1,000	700	.....	.....	.....	.....	2,000
TOTALS	$25,200	$49,200	$57,800	$61,000	$57,500	$22,500	$20,400	$298,600

New Orleans plans rail terminal job

A public improvement program estimated to cost $31 million at present-day prices and involving an outright expenditure by the railroads of $8,600,000 for new terminal facilities has been accepted by a committee representing the seven major railroads entering New Orleans, La., as the basis for negotiations leading to actual construction.

A report describing the entire program was presented March 22 to Mayor Robert S. Maestri by the 6-member New Orleans Railroad Terminal Board, of which Wm. G. Zetzmann is chairman. Mayor-designate de Lesseps S. Morrison, who will take office in May, has indicated that he will support the plan and will reappoint the present members of the board.

It is estimated that about two years of negotiations may be necessary before projects can be advertised to initiate construction. The new union terminal will replace five existing passenger stations. To provide a railroad approach to the new terminal location, the plan proposes to fill in the century-old New Basin Canal for its entire length to Lake Pontchartrain. A proposed express highway would occupy part of the right-of-way thus acquired. Authority to fill the canal must be obtained from the state legislature.

Outstanding among the features of the plan is elimination of many of the grade crossings which are today a common source of delay and hazard to traffic in the city.

Grouping of the railroads in a central terminal with a double-track approach for passenger service and removal of freight yards from downtown New Orleans to outlying sections will lessen the number of grade separations which have to be built. The program envisages construction of eight overpasses and 17 underpasses. Those which cross the new right-of-way will clear both the railroad tracks and the adjacent express highway. The report recommends that the cost of grade separations be divided 85 percent to the city and 15 percent to the railroads. Part of the city's share is expected to come from state and federal aid program funds.

Estimated costs were developed by Godat and Heft, consulting engineers for the board, from preliminary plans and information furnished by the carriers at present prices for labor and materials. Further study may require upward adjustments of the estimates by as much as 20 percent, according to the consultants.

Railroads represented on the committee are the Louisville & Nashville, the New Orleans and Northeastern (Southern Railway System), the Gulf, Mobile & Ohio, the Illinois Central System (including the Yazoo & Mississippi River Valley Line), the Kansas City Southern (Louisiana & Arkansas Ry.), the Texas & New Orleans (Southern Pacific Lines), and the Missouri Pacific group, which includes the Texas & Pacific, the Missouri Pacific and the Gulf Coast Lines.

Two belt lines providing connections across the city are the New Orleans Terminal Co., owned by the Southern Railway System, and the Public Belt R.R., owned by the city of New Orleans. Improved facilities for interchange of freight cars between the railroads are provided in the plans.

Headquarters chosen for Columbia Basin project

Ephrata, Wash., has been selected as the official headquarters of the Columbia Basin project. From this place the Bureau of Reclamation, for the next 30 years or more, will direct the construction of reservoirs, canals and tunnels for irrigation of more than 1,000,000 acres in central Washington.

War Department approves St. Petersburg bridge

The War Department has given approval to the Port Authority of St. Petersburg, Fla., for its plans to construct an $8,000,000 bridge and causeway across lower Tampa Bay from Pinellas County to the Manatee County shore on U. S. Highway 19. According to Chairman E. Leslie Cole, the project could be finished around 1950.

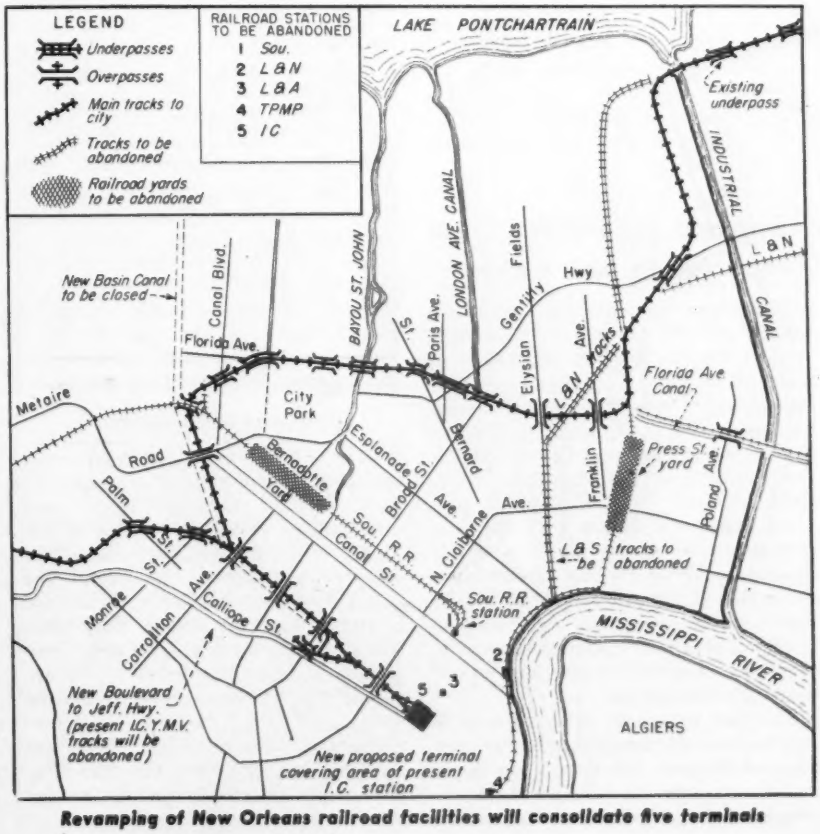
The bridge would have a main span 800 ft. long and a clearance of 145 ft. above high water. With its approaches, the bridge will be more than 10 miles in length from Maximo Point, Pinellas County, to the Manatee shore at McGill Island. Four existing channels will be crossed by the span.

The authority has applied to the FWA for a loan of $325,000 to complete plans.

Gandy Bridge resurfacing

Gandy Bridge, which links St. Petersburg and Tampa, is going to get a new roadway surface.

The State Road Department has agreed to apply a surface treatment to the bridge as soon as engineering details can be completed. The repairs were requested by the St. Petersburg Chamber of Commerce.



Revamping of New Orleans railroad facilities will consolidate five terminals

Engineers sought to aid Panama Canal studies

The Washington office of the Panama Canal is endeavoring to get in touch with qualified engineers who may be interested in the opportunity to work on certain investigations and studies in connection with the canal, as authorized by Congress.

The immediate need is for civil engineers with general engineering experience and demonstrated initiative and imagination in their work; geologists or civil engineers with geological experience (experience in interpreting, logging, and plotting core boring data and geological surface investigations); soils engineers, preferably with special training or experience in earth slopes in both deep cut and high fill sections; civil engineers with construction experience in heavy structures or earth work; engineers, preferably civil, with experience in report writing; and hydraulic engineers with model experience or flood routing and control structure experience.

Applicants should have had from one to five years experience, and the pay rates will be in the Professional Grades 2 and 3, which, in the Panama Canal service, pay entrance salaries of $3725 and $4550 per annum, respectively. Free transportation to the Canal Zone is provided, and salary begins on date of departure from the United States.

Engineers meeting the above requirements, who are American citizens in good health and not over 45 years of age, are urged to write to the Chief of Office, The Panama Canal, Washington 25, D. C., who will furnish further details and application blanks.

Where American transports land in South France

Wartime trans-Atlantic air passengers in Army Transport Command planes bound for Southern France landed on this U.S.-operated field at Istres, about 25 miles west of Marseilles near the shores of the Mediterranean. Seldom publicized and not so well known as Orly, the U.S. field near Paris, Istres was a going airfield, owned by the French government, when taken over by the United States. It contains hangars, runways, taxiways, aprons and administration buildings, but the American forces lengthened runways, increased the parking aprons and built new administration buildings, etc., at a cost of about $2,000,000.

Under recent regulations, the theater commander has the power to declare such airfields surplus, and when this is done, it is understood that the French government will operate Istres again as a major peacetime transport stop. According to the present allocation of routes, Pan-American Airways will use Istres, while Trans-World Airways and American Overseas Airlines will make their French stop at Orly.

Sulphide generation cause reported to pipe makers

Temperature, velocity and strength of sewage are the three most important factors affecting sulphide generation in sewers, the 38th annual convention of the American Concrete Pipe Association was told in Chicago April 12, by Fred D. Bowlus, office engineer, County Sanitation Districts of Los Angeles County, Calif.

By proper consideration of the controlling factors at the time a sewer is designed, said Mr. Bowlus, much can be accomplished toward eliminating hydrogen sulphide generation and resultant sulphuric acid attack without the use of sterilizing chemicals or any form of internal pipe protection.

This fact is brought out, according to Bowlus, in a 60-page report by him and Richard Pomeroy, consulting chemist, recently completed for the County Sanitation Districts. The report, which covers investigations made during a 20-yr. period, is being presented for publication to the Federation of Sewage Works Associations.

Principles developed from the study are being applied to design of sewers in a $12 million expansion of the county system—sulphide generation of more than 9 ppm. in 1931 has been reduced to less than 0.5 ppm. in 1945, and the chlorine dosage has dropped during the same period.

Repeated tests have shown that sufficient velocity can prevent generation of hydrogen sulphide even with sewage of high B.O.D. For 900 ppm. B.O.D., 4 ft. per sec. is required to eliminate sulphide generation, according to Bowlus.

Temperature important

In large free-flowing sewers, the report concludes, sulphides are generated by bacteria on the submerged portion, and the hydrogen sulfide is oxidized to sulphuric acid by other bacteria on the damp upper walls of the sewer. The bacteriological action is directly affected by temperature, the activity being much less at 68 deg. F. than at 78 deg. Ventilation to control oxidation is effective only if it is sufficient actually to dry the walls.

Elmer L. Johnson, Colton, Calif., was elected president of the American Concrete Pipe Association for the current year.

Requires split awards on housing contracts

A bill that require the separation of public housing contracts into at least four parts, with separate bids and awards on each part, became law in New York State, April 9, with the signature of Gov. Thomas E. Dewey.

Under terms of the bill—opposed both by New York City's Mayor William O'Dwyer and Park Commissioner Robert Moses—public housing authorities are required to have separate specifications drawn and bids submitted for plumbing and gas-fitting; steam-heating, hot-water heating, ventilating and air-conditioning installations; electric wiring and standard illuminating fixtures. Such contracts would be in addition to the master contract covering general construction.

Answering criticisms that the bill would cause further delay in construction of housing projects, Governor Dewey admitted that the bill would "increase administrative problems", but contended that the measure would result in cheaper construction by the elimination of the general contractor's profit on sub-contract.

Heretofore, New York housing authorities were exempt from this procedure—taking bids only on a single general contract. However, state agencies, as well as municipal public building authorities, have been required to receive separate bids.

OBITUARY

Torkell Roynesdal, 47, died at New Dorp, N. Y., April 7. He was born at Farsund, Norway, and was graduated from the Kristiania Technical School. From 1917 to 1926, he was engaged in engineering investigations and designs for hydroelectric projects and bridges in Norway, and came to the United States in 1926, where he was a designer on industrial and power projects, with Sanderson and Porter and with Linde Air Products Co. From 1934-1936 he was design engineer for Standard Oil Co. of New Jersey at Lake Maracaibo, Venezuela. In 1936-1937 he was with American Gas and Electric Co. in New York City, on the design of hydroelectric power stations. In 1937-1938 he was with Public Service Corp., Newark, N. J., as a designer of steam power plants.

From 1938 until his death, Mr. Roynesdal was associated with Parsons, Brinckerhoff, Hogan and MacDonald, consulting engineers, New York, as designer on power projects, hydraulic and maritime structures. From 1941 to 1944, he worked with Frederic R. Harris, Inc., as section head on the design of structures for the Brooklyn and Bayonne Navy Yards.

George A. Dornin, 70, Youngstown, Ohio, consulting engineer, died April 2.

Walter George Hunt, 53, president of W. G. Hunt Co., Ltd., Montreal, Que., died April 6. Mr. Hunt was a graduate of McGill University, a councilor of the Engineering Institute of Canada, and a past president of the Montreal Builders' Exchange.

Edward H. Tashjian, 58, construction engineer who supervised many large construction projects in the United States, died in Washington, D. C., April 10. A native of Armenia and an engineering graduate of the University of Wisconsin, he served with the U. S. Army Engineers during the first World War, supervising construction of the Ohio Memorial Bridge across the Sheldt River in Belgium, for which he was decorated by the King of Belgium. While living in Cleveland for many years he was in charge of construction of the public library in that city and several buildings for Western Reserve University. Recently he had worked on war projects in the Washington, D. C., area for the Public Roads Administration.

Harry L. Shaw, 69, construction engineer of Winter Park, Fla., died April 4. He had specialized in railroad construction in Ohio and the west.

Decision expected soon in Kennedy case

The California State Supreme Court on April 2 heard the case of Clyde C. Kennedy, San Francisco sanitary engineer, on a writ of mandate to compel a partial payment by the city of San Francisco on a contract of some $70,000 for the preparation of the design and specifications for a sewage disposal plant (*ENR* Mar. 21, vol. p. 394). Payment was stopped by a suit brought by civil service engineers to enjoin the city from paying Kennedy with the claim that specifications for city works come within the province of the city engineer's office (*ENR* Jan. 31, vol. p. 161).

Adm. Kirby Smith named housing program aide

Rear Admiral Kirby Smith, USNR, has been appointed general deputy expediter for the Veterans Emergency Housing Program by Administrator Wyatt of the National Housing Agency.

Admiral Smith, one of the Navy's top-ranking construction men during both World War I and II, was largely responsible for developing and supervising a $4,500,000,000 building program for the Navy in the United States, Hawaii, the Canal Zone and other strategic outposts. He recently retired from active duty. (*ENR* Dec. 6, 1945, vol. p. 752).

The admiral will be general deputy for Mr. Wyatt. He will concentrate on problems of supply and production.

Engineers to engineer youths' development

The efforts of the staff of the U. S. District Engineer Office at Buffalo, N. Y., will be diverted at least once a week to the problem of juvenile delinquency, Col. Herbert D. Vogel, district engineer said recently.

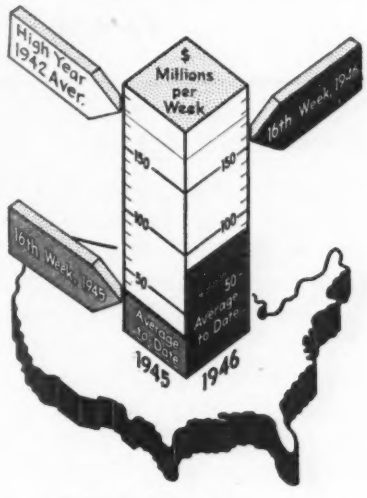
Col. Vogel announced the formation of a "Corps of Junior U. S. Engineers" to be composed of boys 12 to 16 years old.

"We will take them out every Saturday that weather permits," Col. Vogel said, "and let them see just how things are built. If you want to keep them from destroying things, I think you should show them how things are built, how much they cost in time and effort."

While organization is under way, Roy B. Bell, district safety engineer, will act as "Chief Junior Engineer."

Colonel Vogel added that the project is being conducted entirely on the initiative of members of his staff.

CONSTRUCTION ACTIVITY



As Reported this week to ...
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only (Thousands of Dollars)

	Week of April 18 1946	Cumulative 1946 (16 wks.)	Cumulative 1945 (16 wks.)
Federal	$17,722	$152,505	$279,407
State & Mun.	32,077	314,361	56,444
Total Public.	$49,799	$466,866	$335,851
Total Private	104,944	918,013	152,403
U. S. Total..	**$154,743**	**$1,384,879**	**$488,254**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1946 (16 wks.)	Cumulative 1945 (16 wks.)
Waterworks	$1,086	$32,461	$11,237
Sewerage	2,856	17,928	9,252
Bridges	1,799	32,067	7,938
Highways	18,133	166,499	36,242
Earthwork, Waterways	8,326	85,684	10,973
Buildings, Public	9,408	94,918	200,245
Industrial	21,273	316,770	110,599
Commercial ..	65,293	537,552	25,970
Unclassified	26,569	101,000	75,798

NOTE: Minimum size projects included are: Waterworks and waterway projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1946 (16 wks.)	Cumulative 1945 (16 wks.)
NON-FEDERAL	$265,588	$195,112
Corporate Securities..	106,737	43,254
State and Municipal.	158,851	130,958
RFC Loans	.....	20,900
REA Loans	.....	.....
Fed. Aid Highway...	.....	.....
FEDERAL	158,320	77,137
Total Capital	$423,908	$272,249

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost ...	Apr. '46	334.59	160.83
Building Cost	Apr. '46	254.37	137.50
Volume	Mar. '46	256	112

EDITORIALS

VOLUME 136 NUMBER 16

April 18, 1946

Costs All Important

ONCE A YEAR this journal devotes a major part of one of its issues to the subject of construction costs. This is that issue for the year 1946—a year in which costs are destined to occupy the top position among all factors that influence construction. As always, it is not the level of construction costs per se that determines whether a particular project is to be built or not, but rather the relative position of those costs in the economic framework, their trends and their reasonable stability. To satisfy oneself as to these conditions, both historical knowledge and immediate facts are required. The records of wage rates, equipment rental charges and of materials prices, printed in this issue, aid in providing this understanding. Cost indexes that give the overall trends furnish valuable supplementary information and, this year, the well-known *ENR* Cost Index, as well as a comparison among twelve current indexes, are published in convenient wall chart form. To these data is added a new index series on construction labor efficiency devised by *Engineering News-Record* to furnish a measure of this vital factor, hitherto only emotionally talked about. Finally, the issue contains, among others, an article based on a remarkably complete and informed study of costs made for the New York City Housing Authority, which sets a pattern that needs general emulation. The cost section of this issue is planned as a working tool, and as an incentive to better construction costing.

Building Code Types

WHETHER to adopt a specification type or a performance type building code is a relatively new question that cities contemplating code modernization will soon have to face. In its report on Chicago building regulations (p. 84), the Pierce Foundation points to a trend away from the specification-type code, which is almost universally used in this country, toward performance-standards, such as contained in the code now being developed by the Building Officials Conference of America. The former type lists permissible materials and methods of construction, while the latter indicates only desired objectives, such as number of hours of fire resistance that a particular material must withstand. While much can be said for and against both types, some of the most outstanding criticisms of the specification code are based on difficulty of revision and susceptibility to political manipulation. The performance-standards code, on the other hand, conceived to avoid these objections, has been considered by some as too general for use by the average building official, requiring the use of an auxiliary file to list all materials and methods meeting the requirements. Since this type of code has not yet had a trial, it is too early to say whether its advantages outweigh disadvantages to the extent that the specification code should be entirely discarded. Nevertheless, a performance-type code will soon be available, and cities will want to weigh its comparative worth.

Thin Precast Structural Shapes

VALUABLE SALVAGE from emergency war building is represented by a technique for making and using thin precast concrete structural members, developed by A. Amirikian, principal engineer for the Navy's Bureau of Yards and Docks. Cast in shapes similar to steel sections, the concrete members were used to frame warehouses at a naval depot, as described in this issue. The practice there of precasting the thin-section members in concrete molds, handling them in 18 hr. by vacuum lifting devices and erecting and connecting them in a manner similar to that familiar with structural steel offers a chance for useful economies. Cost to the contractor for the pioneer installation was slightly more than for equivalent steel-frame wood-roof warehouses built under the same contract. But with knowledge gained subsequently for improvements in details, casting and erection the contractor now estimates that the fireproof concrete structures, in quantity, can be truly competitive. Thus, again, an expedient born of the necessity to conserve critical materials may develop into a new and useful product of the constructor's art.

More Engineering Research

THAT a large and continuing program of federally financed research will be authorized within a few months now appears highly probable. Consequently, the American Society of Civil Engineers is to be commended for having set up a special research committee to formulate policies for the society and to secure sponsorship of approved civil engi-

neering research by private foundations and private industry.

Proposals to have the federal government finance both a continuing program of research in the basic sciences and the training of research scientists grew out of this country's war experience, which showed how far behind Europe we were in such basic research and how lacking we were in trained scientists when our military research had to be expanded enormously. Unfortunately, the original proposal for such aid made no specific provision for engineering research; the whole emphasis was on the so-called pure sciences. But thanks to the Engineering College Research Association and the Engineers Joint Council, definite provision for aid to engineering research is included in the legislation now being put into final form.

Under the pending legislation, federal aid is to be widely distributed for the declared purpose of stimulating research at many points throughout the country. Most of the research will be done in college and university laboratories. This means that the way will be opened for many research projects that could not be undertaken in the past for lack of funds and workers. Obviously, this condition should permit inauguration of some much needed fundamental research in the various fields of civil engineering.

How to Make Housing Cost More

BASED on the dubious theory that construction costs will be lowered, a new law has been passed in New York State requiring that public housing authorities divide project contracts into at least four parts with separate awards on each. Under such an arrangement the housing authority will assume the responsibility of coordinating the activities of building construction, plumbing, heating and of electrical installation.

In effect, this means that the housing authority must become the general contractor. It must establish and supervise the schedules of four contractors so that their operations are harmonized and expedited. With all deference to the skills and administrative talents of housing authority organizations, it must be pointed out that they have not been staffed to carry out this function. Their real job is to finance, design and manage housing projects.

Moreover, it is doubtful whether a housing authority can achieve the discipline and control among subcontractors that a general contractor exercises. The latter has freedom of choice within certain price limitations to pick those subcontractors with whom he can work most effectively; a housing authority must accept the lowest responsible bidders, and cannot base selection on the intangible but important factor of how well Subcontractor A works with Subcontractors B, C or D, and vice versa. A general contractor knows his subcontractors, probably has worked together with them on several jobs and is the arbiter of a mutuality of interest that provides for most effective performance. And because he exercises sole jurisdiction, the housing authority or owner is enabled to pin responsibility for this performance on a single individual or agency.

The intent of the new law, of course, is to eliminate the fee that is properly charged by the general contractor for his services of supervision, risk and responsibility. However, what might be saved on this score will promptly be paid out—and presumably more—by the housing authorities themselves, who must now be adequately staffed to assume the new function of construction coordinator and supervisor. In addition, the housing authorities are put to the extra expense of handling four bid procedures on each project as well as other administrative detail.

In all likelihood the new law will defeat the very purpose for which it was intended—namely to lower construction costs. Already some builders are reported to have indicated that their bids will reflect a higher "contingency" item because of the probable added risks in working as independent subcontractors. And in New York City, Edmond B. Butler, chairman of the housing authority, reports that the first effect of the bill will be to delay the start of seven projects for several months while new bids and specifications are being drawn.

Early in their history, when public housing authorities were exempted from the system of separate bids—under which, by the way, all New York State building is required to be done—the purpose was to keep construction costs down. What possible justification exists now for revising a procedure that holds every promise for increasing costs?

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Laying Three 1,000-ft. Steel Pipe Lines in a Submerged Culvert

***Contents in Brief**—A failing three-barrel concrete-pipe culvert under railway tracks was repaired by laying, under water, a 48-in. steel bell-and-spigot pipe line in each 6-ft. barrel and backfilling the annular space with pumped-in sand. Old culvert tubes were cleaned by a drag bucket pulled back and forth by a hoisting engine at each end. Steel pipe was placed and jointed, underwater by pulling into position with the hoisting engine.*

AN INGENIOUS METHOD of installing steel pipe lines under water in the barrels of a three-tube tidal-water culvert was employed by Boston & Maine R.R. engineers in a tedious operation recently completed at the Boston North Station passenger yards. Time required for much hand work by divers, waiting for favorable tide conditions and proceeding so as not to interrupt train movements or the continuous operation of the culvert carried the construction over a period of nearly two years. The operation was unique in its plan for moving the 10-ft. lengths of 4-ft. pipe end-wise into the flooded 6-ft. barrels of the old culvert in position for easy alignment and jointing.

Tedious preparatory task

The problem of reconstruction arose in May, 1943, when a section of the old culvert showed disintegration and indications of collapse. The culvert had been built in 1929 of precast bell and spigot concrete pipe, Fig. 2, having 72-in. vertical and 68-in. horizontal diameters and 6-in. shells. The concrete pipes were laid parallel, 9 ft. apart on centers, and were 1,000 ft. long. They were built to allow a section of Millers River to be filled in and eliminate bridges and trestles while providing free tidal flow. Upon discovery of the dangerous condition a cofferdam was built around the threatening section and timberwork was installed to carry the tracks.

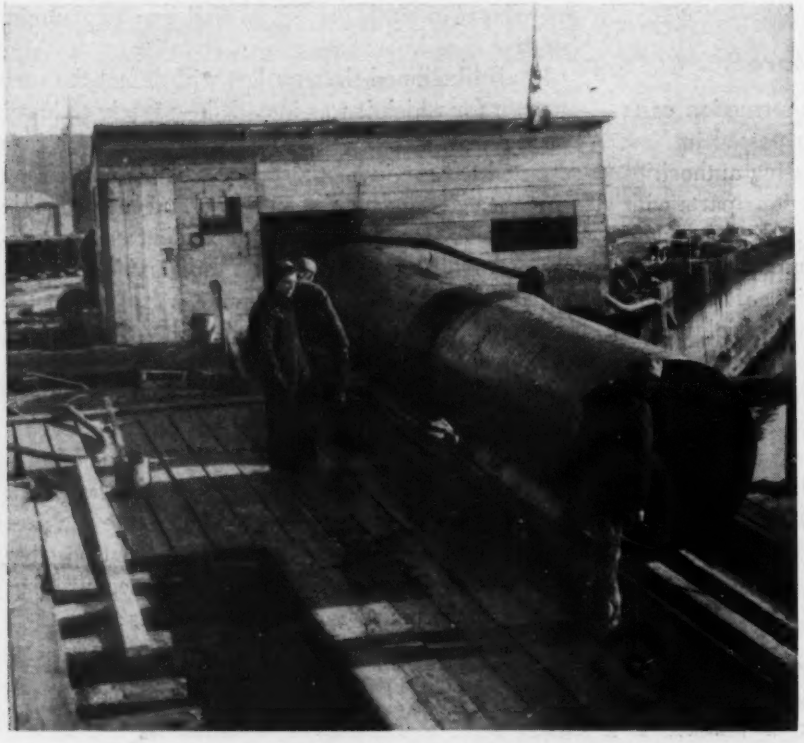


Fig. 1. Upper end of ramp track running down under water to the portal of the concrete culvert pipe being repaired with steel pipe interlining.

Then began the task of probing through the underground pipes to learn the extent of damage and to evolve a method of repairing it. It was found that inspections could be made once a month for a period of an hour at low tide as only then was there a zero or minus tide that permitted workers to explore the pipes in wading suits and with head and shoulders barely above the water surging through the tubes. The inspection was made more difficult by finding all pipe partly filled with gravel, in places to a depth of 3 ft. Exploration required several months until it was definitely determined that the old concrete pipes must be replaced.

The plan decided on was to construct new steel pipe lines as large as practicable inside the old concrete tubes. Tentatively a 54-in. pipe was planned.

The first task was to clear the gravel out of the old concrete tubes. A hoisting engine was set up at each end and a rope was floated through the tube to be cleaned. With the rope a steel cable was pulled through and connected to the two hoisting engines. This cable carried a drag bucket, designed to fit the bottom of the tube, which was dragged back and forth in one tube after another until the bulk of the deposits was removed. Then a heavy chain was dragged back and forth many times to scarify and loosen clinging material so that it was washed out by the tides.

The concrete tubes had failed, apparently from concrete disintegration,

at several places in parts above the haunches. The final task was to clean out the broken concrete and reinforcing rods and this was done by divers working two together, one doing the work and one assisting in handling lines and gear and keeping the air lines clear. At times the work was 400 ft. inside the tubes. It was found that the bottoms of the concrete tubes remained true to line and grade.

Installing the steel pipe

The steel pipe was pulled into each tube, a section at a time, and jointed by the same hoisting engine and cable arrangement used in operating the scraper bucket. At the east or the harbor end a trestle ramp was built from ground level down into and under water to the portals of the concrete tubes. Fig. 1 shows the upper end of the ramp and other parts are indicated by Figs. 2 and 3. These views also indicate the cradle track on which the pipe rode down the ramp to the portal of the tube being repaired. Fig. 2 shows a section of the cradle track in relation to the tube portal and the pipe section being placed. As the steel pipe in one tube was completed the track was shifted into line with the next tube and so on to all three.

To replace the old tubes with as large a pipe as possible, trial was made with a dummy pipe 54 in. in diameter but it stuck in every tube. Trials with a 48-in. pipe were successful and this size was adopted. Fig. 2 shows a section of pipe as outfitted with skids on which to ride the cradle track and tube invert.

Another preparatory operation was to paint each section of pipe inside and outside first with a bituminous priming solution and then with bituminous enamel, both applied hot. This was expected to delay erosion as well as to prevent rust.

The pulling device was a sheet steel mandril with conical ends to which the pulling and retrieving cables were hooked. This mandril was fitted into the pipe section as shown by Fig. 3. Lugs on the mandril contacted the bell end of the pipe which was pulled into the tube spigot end first. The mandril gave the pipe rigidity, provided an axial pull to hold it in line and helped to guide the spigot into the bell of the pipe in place. When the pipe section was seated the pull cable was slacked

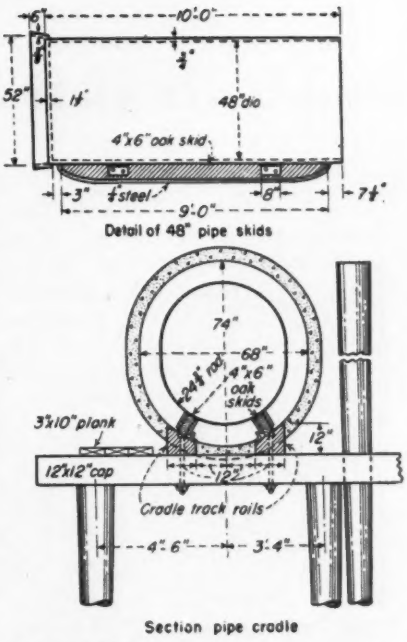


Fig. 2. Details of the steel pipe and a cross-section of the cradle track in relation to the concrete pipe and its steel pipe interlining.

off and the return cable withdrew the mandril up the ramp track to be fitted into another section of pipe.

This procedure continued through all stages of the tide until all 300 lengths of pipe were in place. A special bell enabled the spigot to enter easily and fit tightly. The joints were not caulked. Tests at the end of the work showed that the joints were closed within ⅛ in. average for all 300 lengths of pipe.

Backfilling the tubes

With the steel pipe lines in place, a concrete bulkhead was built at each end of each concrete tube. This filled the annular space around the steel pipe except for 10 in. at the top, which was left open so that the tide could surge through. Fine sand was then pumped in at each end to be carried in around the steel pipe by the flow of the tide. When the current was west the filling was done from the east end and then, when the tide changed, from the west end. This washing back and forth of the sand secured a very tight back fill.

When no more sand could be pumped in, the amount used checked accurately with the calculated volume of the space to be filled.

All the work described was planned and carried out by the forces of the Boston & Maine R.R. engineering department, T. G. Sughrue, chief engineer. H. K. Ashley was the engineer in charge of the work.

Fig. 3. Inserting the pulling mandril in a section of steel pipe preparatory to pulling it into the underwater culvert pipe.

Southern Ry. Builds Its First Precast Bridge

LATE IN 1945 the Southern Railway Co. completed its first important precast concrete trestle. The methods used proved so successful and economical that construction of a second major crossing of similar design has been authorized.

The new bridge carries the railroad's double-track main line across the Haw River near Reidsville, N. C. It replaces an old timber trestle and is 480 ft. long. Designed for a Cooper E-65 loading, the structure consists of four lines of precast deck slabs supported on six-pile bents built of 24-in. dia. precast octagonal piles.

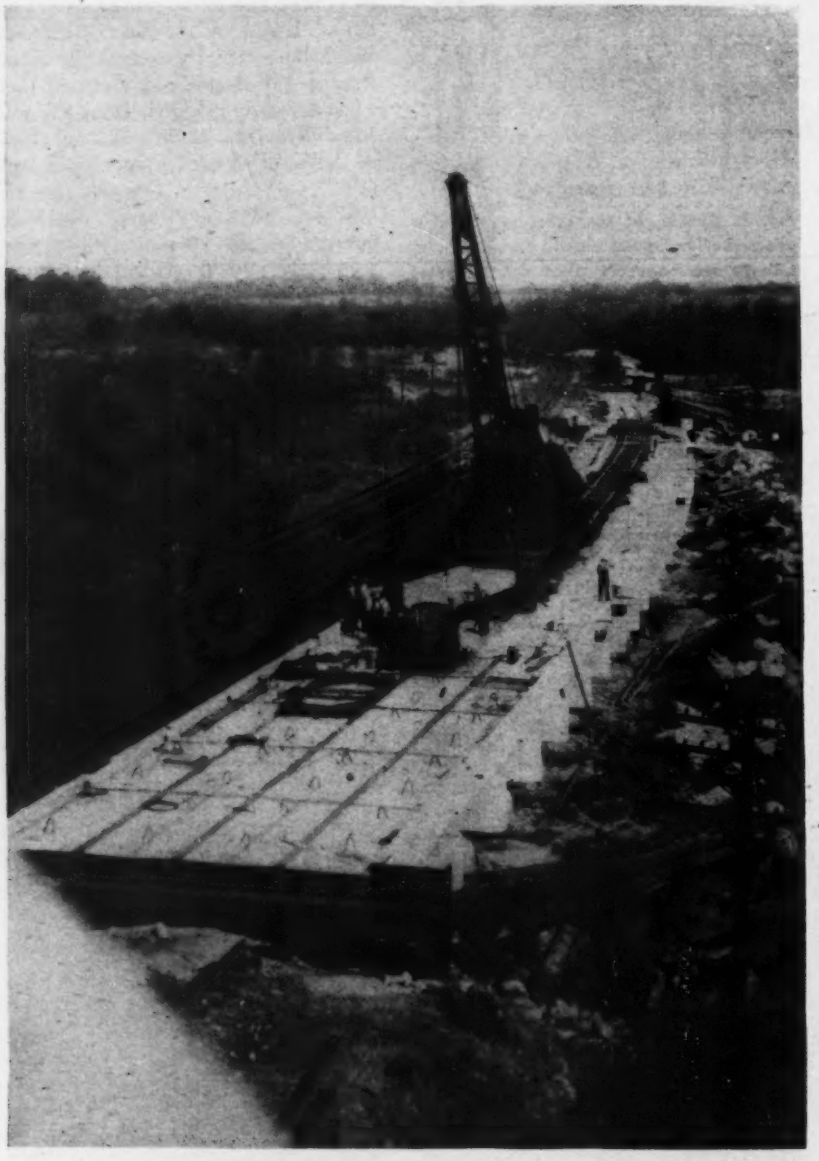


Fig. 1. To carry its double-track main line across the Haw River, the Southern Railway Co. constructed a reinforced-concrete bridge with a precast deck. A temporary timber bypass trestle was used while the new crossing was being built.

In driving the piles, which bear on rock and average about 25 ft. in length, an 18,000-lb. single-acting steam hammer with a 9,300-lb. ram was used. The hammer was handled by a 40-ton locomotive crane with a 50-ft. boom. The crane was selected especially for the work because it was equipped with a 66-in. dia. boiler, which was considered the minimum size suitable to supply steam for the large hammer used.

Heavy timber frames were used to hold the piles in place and their use resulted in excellent alignment, the top of the piles deviating not more than an inch either way from the desired position. The piles were placed in pilot holes 6 to 8 ft. deep. These holes were put down with a hand earth auger. A power auger has since been received and will be used on similar jobs in the future.

On the early stages of the work difficulty was encountered in cutting off the piles at the desired level. This problem was overcome later by the following method.

Horizontal holes 1½-in. diameter were drilled in the center of each of the flat faces at the final cut-off elevation, using heavy jack handles. Since the reinforcing rods had to be stripped 2 ft. to tie into the cap, another set of holes was drilled 2 ft. higher. A vertical hole was then drilled down through the center of the pile to about 4 in. above the top cut-off, and the head was blown off with dynamite. It was then an easy matter to break out the concrete with the paving breaker and to strip the reinforcing steel. None of the piles cracked below the bottom set of holes.

Construction of the pile caps, which measure 3 ft. by 3 ft. 6 in., required the only cast-in-place concrete used on the project. A concrete with a minimum compressive strength of 3,000 psi. at 28 days was specified.

For the deck and the precast piles, a concrete with a minimum strength of 4,000 psi. at 28 days was prescribed. The deck sections were cast in steel forms at Birmingham, Ala., and shipped to the job by rail. They all measure 7 ft. wide, about 16 ft. long

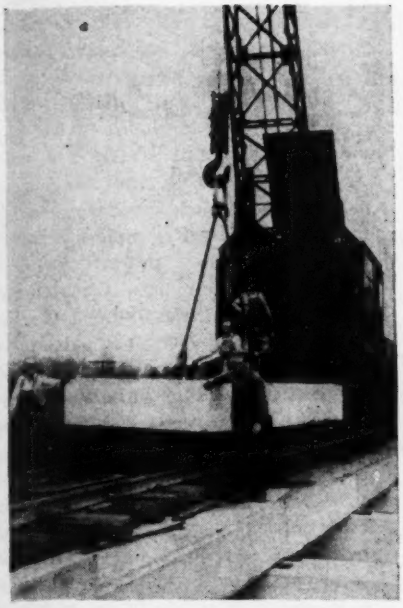


Fig. 2. The deck sections, which weighed about 16 tons, were delivered to the desired point along the bridge and set in place by a locomotive crane with 50-ft. boom.

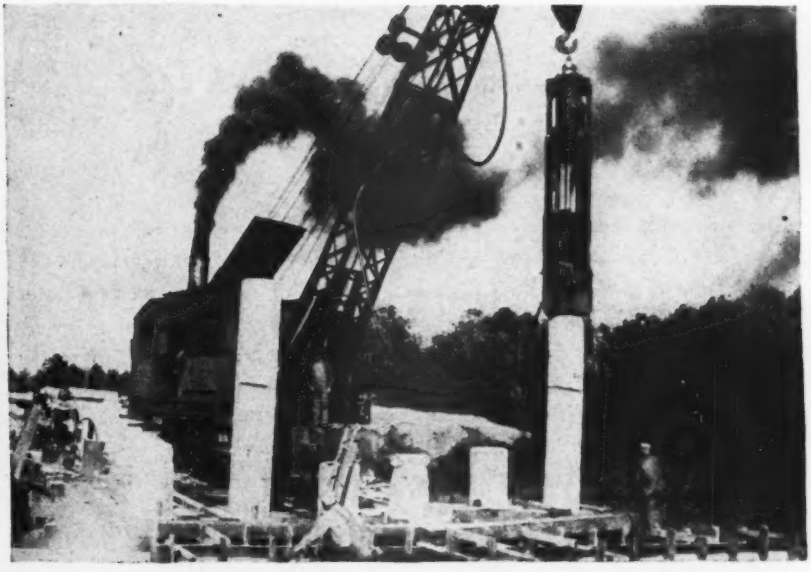


Fig. 3. In driving the large precast piles an 18,000-lb. single-acting hammer with a 9,300-lb. ram was used, which was handled by a locomotive crane with boiler capacity adequate for a hammer of that size.

and approximately 2 ft. thick. Each section weighs about 16 tons.

It was possible for the locomotive crane to install 16 to 20 sections in an 8-hr. day. Two $1\frac{1}{8}$-in. dia. steel loops located on the longitudinal center of gravity of the slab provided a method of quick attachment. These loops were set with 1-in. deep recesses and were burned off once the slab was in place, the recesses then being filled with grout.

Sections set in cement mortar

To assure uniform bearing, the slabs were set on a thin layer of non-shrinking cement mortar. The latter was confined within thin timber strips held in place by means of nails driven into wooden plugs embedded in the cap.

Adequate drainage of the deck is provided by two 3-in. dia. drains equipped with cast iron strainers in each slab section. To prevent water from draining away between sections, a 1 x 8-in. asphalt plank laid in asphaltic mastic was placed over all the longitudinal and transverse joints. Shallow grooves were provided for the plank.

The appearance of the surface of the finished deck was so good that it was decided not to damp-proof the top surface of the deck.

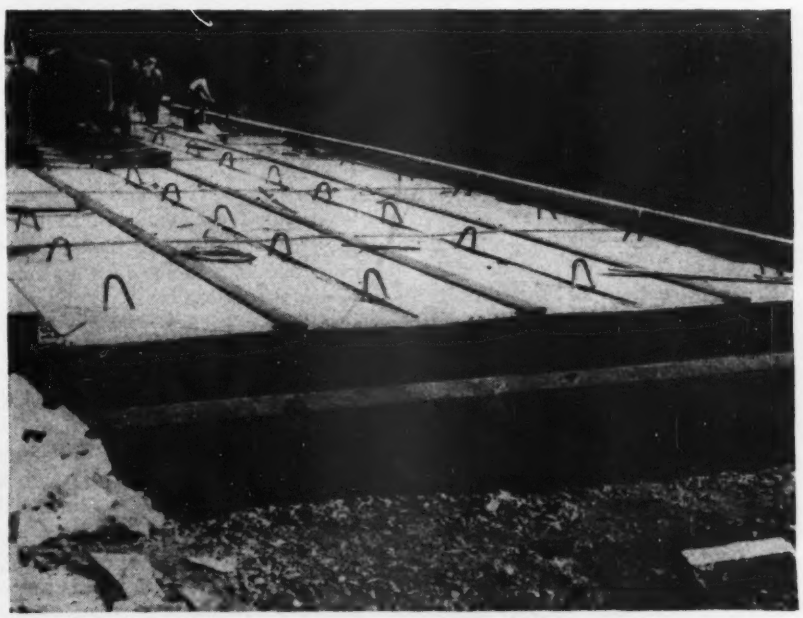


Fig. 4. The joints in the deck were sealed by addition of a 1 x 8-in. asphalt plank laid in asphaltic mastic. The steel loops used in lifting the sections were later burned off and the recesses in which they were set filled with grout.

After the track had been installed sufficient crushed stone ballast of about $2\frac{1}{2}$-in. dia. maximum size was added to provide a minimum of $6\frac{1}{2}$ in. below the ties. The ballast was then compacted in place with equipment normally used on maintenance work.

The bridge cost only about $8 per track foot more than the estimated cost of timber construction. In view of this fact, plus the expected low maintenance cost and long life of reinforced-concrete construction, the railroad has decided to construct a second crossing of similar design.

The Southern Railway built the bridge with its own forces. Massey Concrete Products Co., Chicago, Ill., manufactured the piling and the deck sections.

Prescription for Ailing Building Codes

***Contents in Brief**—Conducting an objective survey of building legislation for the Chicago Association of Commerce, the John B. Pierce Foundation compared the Chicago building code with that of other cities and with standards of recognized scientific organizations. The study indicated that while the general level of building requirements in Chicago is not greatly different from that in other codes, a complete revision of the Chicago code is desirable. Reasons given for this decision include difficulty of application, poor coordination with other legislation, obsolescence, restrictiveness of requirements and too much variation from generally recognized national standards.*

A CRITICAL REPORT on building codes (*Building Regulation in Chicago*, published by the Chicago Association of Commerce) has just been submitted by the John B. Pierce Foundation. While the study centers around Chicago building regulations, findings are based on a comparison of the Chicago code with many other codes and with recommendations of scientific bodies concerning building rules in general. Hence, the findings hold significance for all interested in building regulations. Following is a summary of the report.

The Pierce Foundation, a non-profit organization set up for research in the construction and housing fields, was asked by the Chicago Association of Commerce to undertake the study in the belief that a comprehensive examination of local building laws was necessary to facilitate an expected, unusually high level of activity in building following the war's end. The foundation placed the work under the direction of Howard P. Vermilya, its director of housing research, and to supplement its own staff engaged Skidmore, Owings and Merrill, architects and engineers. This firm assigned John Merrill, a registered architect and licensed structural engineer in the state of Illinois, to conduct the technical phase of the study.

Dealing with legislative and administrative problems as well as building requirements, the report covers procedures in various cities for establishing and revising building codes, delegation of legislative power to administrative agencies, use of performance standards for materials and effect of restrictive specifications. It points out that building legislation, as reflected in construction costs, affects the social and economic development of the city.

Construction costs in Chicago, the report states, are higher than in many other areas, and to retard new building. Legislative regulation is a significant contributing factor to high costs. It does this in many instances by specifying higher requirements than necessary for safety and health, thereby requiring the use of excessive or more expensive materials, and by establishing requirements that restrict the use of adequate alternate materials and construction, thereby creating monopolistic conditions with attendant increases in cost.

Regulation burdens legislature

Regulation of building construction in Chicago follows the traditional pattern, consisting in general of complete enumeration of the methods and materials permitted in such work. The degree of rigidity with which the regulations are written, however, shows no consistency. In some cases, the objective is formulated so that alternative materials or methods may be used, but in many other cases a single approved means of compliance is described.

● **"Building regulation, to accomplish the proper purposes of governmental regulation", says the Pierce Foundation, "cannot prohibit the use of materials and methods of construction that are equivalent or superior to permitted materials and methods."**

This method places complete responsibility in Chicago upon the City Council, which is not particularly selected for technical skill or knowledge in the field of building requirements. The burden is heavy. Over half the Municipal Code of Chicago is concerned with building regulation.

Since its adoption in 1939, the Chicago code has been continuously before the City Council for amendment, and over 200 sections have been amended at least once and some several times. Despite this progressive revision, the code is obsolete in many important respects. Every one of the 21 standards that were developed under the auspices of the American Society of Testing Materials and adopted by reference in the Chicago code has been revised at least once by the society. But with one exception—the standard for portland cement—the City Council has not authorized the acceptance of any of these modified standards.

"While the code provided for their original incorporation," the Pierce Foundation points out, "it provided no procedure for keeping them up to date"—nor did it place responsibility for that on any city department.

Such progress as is recognized by technical societies is denied to Chicago when there is failure to keep these standards up-to-date. Furthermore, the enumeration of permitted materials and methods of construction automatically makes for obsolescence in building regulations, even though the Chicago code attempts to deal administratively with the problem of obsolescence.

Approval of new materials

In the present code there is established a Committee on Standards and Tests, to which may be submitted an application for approval of a material or method of construction. The committee investigates and, if the material or construction is found satisfactory by a majority, submits its recommen-

dation to the City Council. Many other jurisdictions have attempted to solve this problem in a somewhat similar manner.

In the procedure chosen by Chicago there are certain defects, which, according to the Pierce Foundation, probably account to a considerable degree for the relative lack of accomplishment of this committee. These defects are:

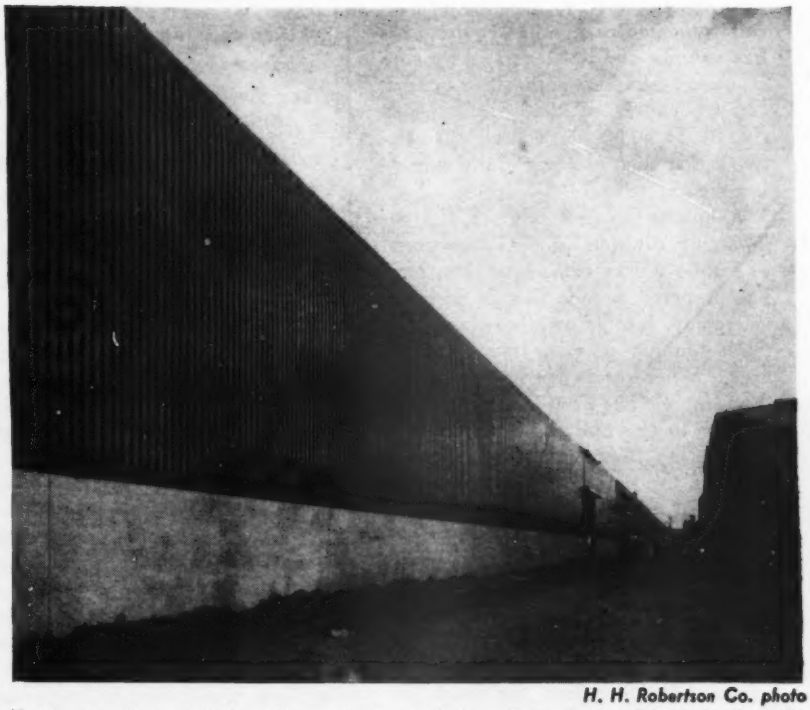
1. The requirement that the recommendation of the committee be submitted to the City Council, which implies that the committee's recommendation may be rejected. If rejection occurred, it is unlikely that such action would be based upon technical questions of equivalency, because judicial decisions have determined that materials must be accepted in these cases. Such action, in all probability, would be based upon other considerations. Rather than reject the recommendation of the committee, the council is more apt to pigeonhole it. Moreover, this requirement serves to delay action.

2. Emphasis is seriously misplaced when the burden of initiative rests upon the person desiring to use a new material or method. Restrictions should be imposed only for the benefit of the people of the city and not for the protection of economic interests. Responsibility for investigation and appraisal of materials and methods is that of the governmental agency imposing the restrictions.

Availability of new materials is a matter of importance to the community. If the municipality fails to accept its responsibility for the continuing investigation and testing of new materials and methods, inertia or considerations of the relation between cost of securing municipal approval and potential profit by industry may deter utilization of a new material.

Delegation of authority

The need for greater delegation of power to administrative agencies to reduce the burden on the legislature is clearly evident and recognized by other jurisdictions. Returns from a questionnaire that was sent to some 30 cities by the Pierce Foundation disclose that very few rely upon the legislature to handle the question of new materials and methods of construction. In most cases, this power is given to a board. In other cases, the decision of the building commissioner is all that is required, and often his decision is subject to appeal to an appointed board. In Los Angeles, however, annual revision of its regulations is required and, therefore, the code is checked in this respect each year.



H. H. Robertson Co. photo

North American Aviation Corp. plant at Dallas, Tex., has cellular steel walls. Many codes do not list light-gage steel as an acceptable material.

The American Standards Association, in its *Administrative Requirements for Building Codes*, approved Jan. 31, 1944, provides for submission of information substantiating the analysis of the construction to the building official, who may then request additional evidence, but all his rulings are subject to appeal to a board appointed by the mayor. Provisions of the Boston code are almost identical with that of the American Standards Association.

New York City has a more elaborate and comprehensive administrative procedure, in tune with the problems of a large city. While its building code is similar in nature to that of Chicago, broad authority is conferred upon the Board of Standards and Appeals to establish rules respecting the testing and approval of materials and methods of construction. The board, in formulating regulations, must abide by the standards established in the building code, but within them it may interpret, amplify and supplement the code.

The trend in building regulation toward greater delegation of power to administrative agencies raises legal questions for Chicago. The attitude of the courts in Illinois with regard to the delegation of legislative power has been a very definite handicap to the development of administrative procedures that would permit a ready solution of the problem of growth in building regulation.

If Chicago is to progress, the Pierce Foundation claims, it is essential that the City Council assume the risk of possible judicial action but minimize it by establishing democratic procedures which would assure that:

1. All rules are based upon a finding of fact and are in accord with the standards established in the building code.

2. All regulations are established only after a public hearing at which all interested parties can be heard.

3. All rulings are rendered in writing and published in an official publication.

4. There is provided a procedure of appeals from the decisions of the administrative agency.

In recent years, there has been a

growing recognition that the specification method of writing requirements has definite disadvantages. As a consequence, building authorities are becoming convinced that requirements should be stated as a desired objective rather than as a method of achieving the objective.

Adopting the new practice, the engineering division of the Department of Public Works of Kansas City, Mo., has prepared a code that is designed to employ, insofar as is now possible, the technique of performance standards. Wherever it has been possible, the principle has been followed of delegating to the building commissioner and to the Board of Standards and Appeals, the power to write rules carrying out the general functional requirements of the basic building legislation.

While primary responsibility centers in the Department of Buildings, regulation in Chicago is administered by many agencies. This diffusion of responsibility suggests the need for coordination.

Consolidation of building regulation enforcement is general administrative practice in other large cities. The Pierce Foundation study indicates, however, that there is no one administrative pattern for the consolidation of building regulation activities in those cities that have attempted to simplify the administrative problem. But sound administration indicates the desirability of complete control in one department.

● Building regulations formulated as performance standards, the Pierce Foundation finds, would provide the complete flexibility and responsiveness to new developments that is desirable. New materials and methods could be used without legislative action, if capable of meeting performance standards.

Composition of Chicago code

Perhaps the most significant part of the Pierce Foundation report is the section analyzing Chicago's building code.

For example, the report states that floor loading requirements of the Chicago code are generally in accord with standard practice, but the methods of calculating roof loads show wide variety in design criteria. Recent studies in the action of wind pressure indicate the necessity of requiring resistance to outward as well as inward acting forces. The Chicago code does not require resistance to outward acting wind forces for roof design.

Several codes establish wind loads graded in accordance with building height, so that smaller loads are required for smaller buildings. Chicago specifies the same load for all buildings up to 275 ft. (about 25 stories) in height. Consequently, modification of the method of establishing wind load assumptions can reduce costs of low buildings.

Further economies are possible through live load reductions on columns and girders. The newly developed standard of the American Standards Association indicates possibility of savings through increased reductions in live load in large buildings.

Allowable stresses compared

Allowable stresses in materials permitted by the Chicago code are with a few exceptions in general conformity with those of other codes. Further study, however, should give consideration to structural steel, for which the tensile stress assigned, 24,000 psi., is greatly in excess of that permitted by other codes, and to dimension lumber, for which stresses are lower than recognized by national authorities and inadequate in that no stresses are assigned for the No. 2 grade usually used in frame construction. In general, allowable stresses are inadequate in that they make no provision for materials in certain types of construction, such as reinforced gypsum, not included in the code.

Structural design in masonry, the Pierce Foundation reports, is governed not so much by engineering formulas as by considerations of stability, quality of workmanship and the association of other structural materials with masonry. The requirements of the Chicago code in this respect are similar to other codes with the exception of those for two- or three-story single family dwellings and three-story multiple dwellings, where Chicago requires thicker walls than other codes. Since these constructions comprise a large percentage of buildings erected under the code, very serious considerations should be given to modifying these requirements to conform to other standards.

The Chicago and Boston codes and the standards of the American Standards Association show a considerable variation in allowable masonry unit stresses. Chicago allows higher stresses for brick and lower stresses for stone when compared with other localities included in the analysis.

The City Council adopted on Feb. 27, 1945, by reference, the 1941 code of the American Concrete Institute with certain exceptions, one of which applies to the design of tied and spiral columns. A comparison of the Chicago formulas with those of the ACI shows that both methods of design result in about the same allowable load for the same column section. In the interests of uniformity, since there seems to be little advantage to be gained in the special formulas required by Chicago, consideration should be given to permitting the method of computation favored by the ACI.

Another exception is the omission of the provisions of the ACI code permitting the use of light-weight aggregates in concrete. This prohibition is unnecessarily restrictive. Also, the Committee on Standards and Tests disapproved an application of the Portland Cement Association, made in 1944, to increase the tensile strength of reinforcing steel in concrete to 24,000 psi.

The Chicago code does not provide for reinforced gypsum construction, except by listing such slabs as conforming to fire resistive standards for roof slabs. The reference is inadequate in that no structural requirements governing the design of these slabs are included in the code.

Light-gage steel

The use of light-gage steel for floor and roof construction is not specifically excluded by the Chicago code. Structural members carrying less than 100 sq. ft. of floor area are exempted from provisions as to minimum thickness of metal. But the code contains no standards or design formulas, minimum gages or other construction provisions for light steel construction, to guide the building commissioner, the Committee on Standards and Tests, manufacturers, architects or builders.

Provisions for the use of light-gage steel are contained in detail in other recent codes, particularly the Boston building code and the *Uniform Building Code of the Pacific Coast Building Officials Conference.*

Further, light steel construction is not listed as one of the acceptable materials for floor and roof construction. Yet the use of light steel has been common in other areas for some time for both bearing and non-bearing walls and for roof decks.

Consideration should also be given to various types of glued wood structural elements, such as stressed-skin plywood panels and laminated arches, girders and columns, which have been developed during the last ten years and have been used extensively in wartime construction. With the perfection of the resinous glues that made these developments possible, extensive use may be contemplated in postwar building. Basic provisions governing the use of such construction should be included in the code.

Fire resistance ratings

Chicago regulations on the subject of fire protection for new buildings follow the general practice where requirements have been based largely upon tradition and personal opinion, personal experience and personal judgment. Naturally, standards of this character will be particularly varied; they will be high in some instances and low in others, depending on the character and opinions of those who prepare them.

Recently, as a result of research work done at the National Bureau of Standards, there is being evolved an engineering basis for the establishment of fire protection regulations. It seems probable that this research will permit a substantial reduction in many requirements while others may be found inadequate.

The development of the standard fire test by the American Society for Testing Materials has provided a basis for determining the degree of fire protection required in terms of hours of resistance for exposure to fire and temperatures of prescribed standards of severity. As a consequence, it is no longer necessary to use descriptive specifications for the material or method of construction except in such general terms as combustible or noncombustible.

Since the fire protection requirements comprise at least 50 percent of all the requirements in the building code and since they are, generally speaking, the most restrictive in the manner in which they are phrased, the adoption of more flexible and logical rules is a most important potential factor for substantial reductions in building costs.

Height and area limitations

The comparative study demonstrated such lack of uniformity in the requirements of various codes with regard to height restrictions for single-family dwellings, multiple dwellings and office units for various types of construction that it is difficult to generalize on the basis of the data developed. In general, however, Chicago's height limitations for fire protection for single-family dwellings are more restrictive than for other cities studied.

As with height limitations, the comparative study indicates a great lack of uniformity in the floor area limitations established for various types of construction and for different classifications of use. The provisions of the Chicago code follow the old practices of limiting the floor area and give no consideration to other conditions affecting the area, such as street frontage, distance between buildings and fire-protected interiors, except where automatic sprinklers are used.

The establishment of fire limits in building regulations recognizes increased conflagration hazard in congested areas. But, says the Pierce Foundation, as now established, Chicago fire limits make little sense from the standpoint of the basic underlying reasons for the establishment of such limits, namely, protection against conflagration. These limits include 85 percent of the area of the city, and the excluded areas bear little relation to the present intensity of land development and to zoning. Significant with respect to low-cost housing, the study of the fire limits demonstrates that permitted construction types for housing are limited in Chicago.

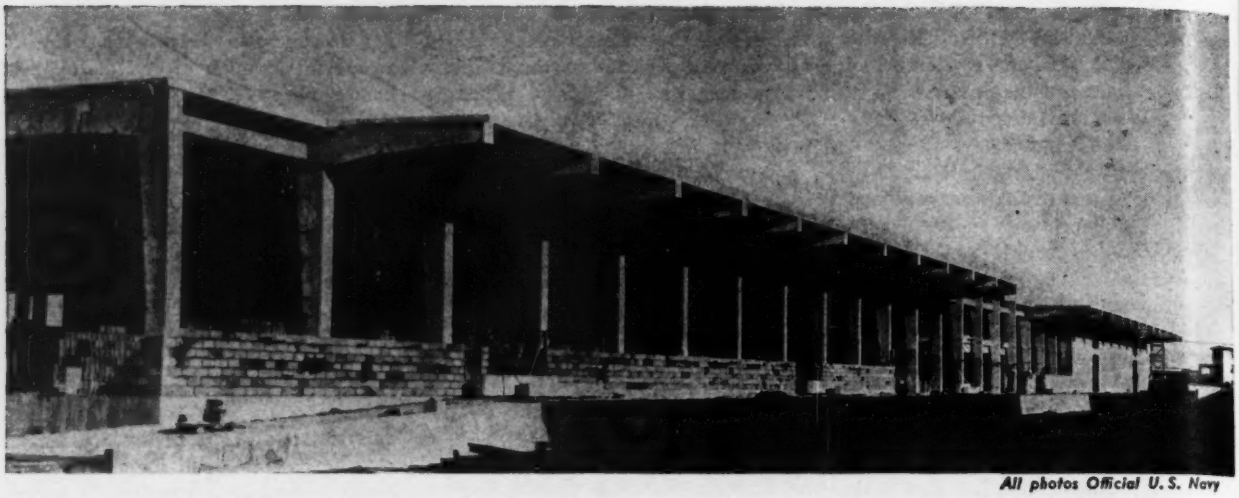
Another regulation deterring low-cost housing in Chicago is that prohibiting dry-wall construction. An analysis of this requirement indicates that it is not only highly restrictive but the factors upon which fire and health protection are apparently based are inappropriate, says the Pierce Foundation. Thickness of surfacing materials, as such, has no relation either to fire protection or to sanitary quality. The requirement for sanitation provided by a "seamless, unbroken, plastic surface" is not realistic in view of the fact that such surface may be finished with many types of rough texture, which can harbor dirt, or may be completely covered with wainscoting, porous acoustical or other surfacing materials.

Other sections needing revision

The Pierce Foundation report finds that several requirements of the Chicago plumbing code need modification, but no specific recommendation is made with regard to the electrical code. It points out, however, for further consideration examples wherein the requirements of the Chicago code exceed those of the National Electrical Code. Also, mechanical ventilation requirements in codes are shown to vary considerably.

In a simplified form, the recommendations of the Pierce Foundation suggest that building legislation in Chicago be redrafted to provide basic regulation pertaining to safety and health in a manner that will secure simplification, flexibility and coordination of building requirements; consolidation of administration in one agency so as to make possible greater efficiency, lower operating cost and unified administrative responsibility; and delegation of power, with proper safeguards, to the administrative agency to adequately interpret building legislation so as to obtain greater flexibility to meet changing conditions.

● "None of the formulas," (for roof loads in the codes reviewed), states the Pierce Foundation, "apparently has met the need in that the transition from a flat to a steeply pitched roof does not provide a gradual modification in the various live loads assumed as the pitch of the roof changes. The modification of the assumptions at 15-, 30-, and 60-deg. roof slopes, the method used by most codes, causes wide differences in loads at these points."



All photos Official U. S. Navy

Fig. 1. Framing of one warehouse of precast structural members was completed in 40 days and a second in only 18 days.

Precast Structural Members Facilitate Speedy Erection of Rigid-Frame Buildings

W. Mack Angas
Commodore (CEC) USN
Superintending Civil Engineer, Areas I, II, III,
Bureau of Yards and Docks, U. S. Navy.

***Contents in Brief**—Precast concrete roof slabs and hollow-box rigid frames made rapid erection of two, one-story warehouses at Mechanicsburg, Pa., possible at relatively low cost. These members, made with high early strength cement and drained of excess water by the vacuum process, were lifted from the forms within 24 hr. after casting by suction pads composed of light steel frames faced with plywood and bordered with soft rubber gaskets. Ingenious assembly methods speeded erection.*

NOVEL USE WAS MADE in the construction of two, large single-story warehouses at the Naval Supply Depot, Mechanicsburg, Pa., of thin channel-shaped concrete sections. Bolted together, these precast members formed hollow-box girders and columns, which were integrated into rigid frames upon erection by welding of the reinforcing and concreting of the joints. With no precedent to go by, the contractor devised some interesting and effective means for precasting the thin sections, handling the green concrete and erecting the structure.

The innovations in design of the Mechanicsburg warehouses and the unique methods developed by the contractors for the construction of the buildings, promise to produce a type of fireproof structure that can be built about as quickly and cheaply, in quantity, as existing types of semi-permanent buildings that are, to say the least, extremely vulnerable to damage by fire. Features of the design of these warehouses and methods used in their construction might be applied profitably to many types of postwar construction.

The concrete foundations and floors of the buildings are of the conventional type and were constructed by conventional methods, as were the hollow concrete-block, exterior walls (Fig. 1). The columns and girders supporting the roof are, however, not of ordinary construction. They were built of precast reinforced-concrete members assembled by a combination of bolting, welding and concreting to form rigid frames of extremely light hollow members (Fig. 3). The quantity of concrete poured in place to connect the precast members was very small.

The concrete roof slab consists of 100-sq. ft. precast panels, which span the 20-ft. space between the rigid frames, with no joists or purlins other than the girders and beams cast integrally with the panels (Fig. 2).

Exterior columns, T caps of the interior columns, and girders of the rigid frames were cast in two pieces that were bolted together to form hollow box members, which were stiffened by interior diaphragms. Interior columns and horizontal struts connecting the bents were cast in a single piece, the hollow cores of these members being formed by a treated cardboard tube. Left in place, the tube was removed only at the upper and lower ends of the columns to permit the exposed concrete to be cleaned by

sandblasting so as to provide a good bonding surface for the cast-in-place concrete used to connect the precast members.

All precast members were poured in an outdoor casting yard, using forms of hard-surfaced and smooth-troweled concrete, with sides of wood hinged to promote rapid removal and reassembly. Excess water was removed from all precast sections by the vacuum process to promote soundness, strength and rapid curing. To make it possible to remove the members from the forms and transport them to the curing and storage yard within 24 hr. after pouring, high early strength cement was used in the mix, and suction pads, supporting the sections throughout their entire length, were ingeniously used for lifting (Fig. 4).

The suction pads consisted of light structural steel frames faced with plywood and surrounded with soft rubber gaskets. There were one or more pads for each type of precast section to be handled, shaped to fit the upper surface of the member it lifted.

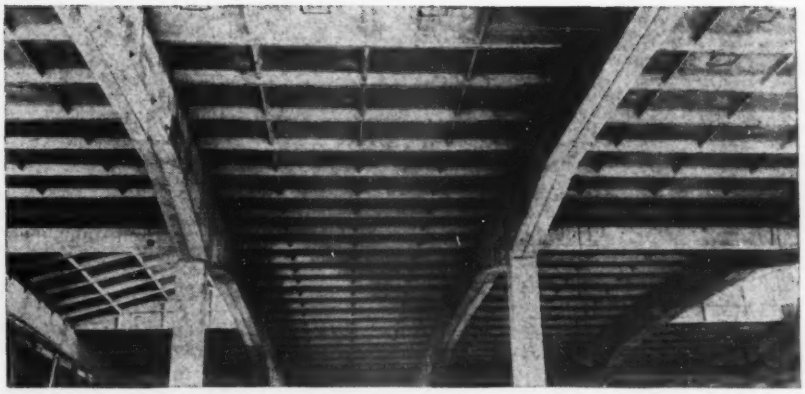
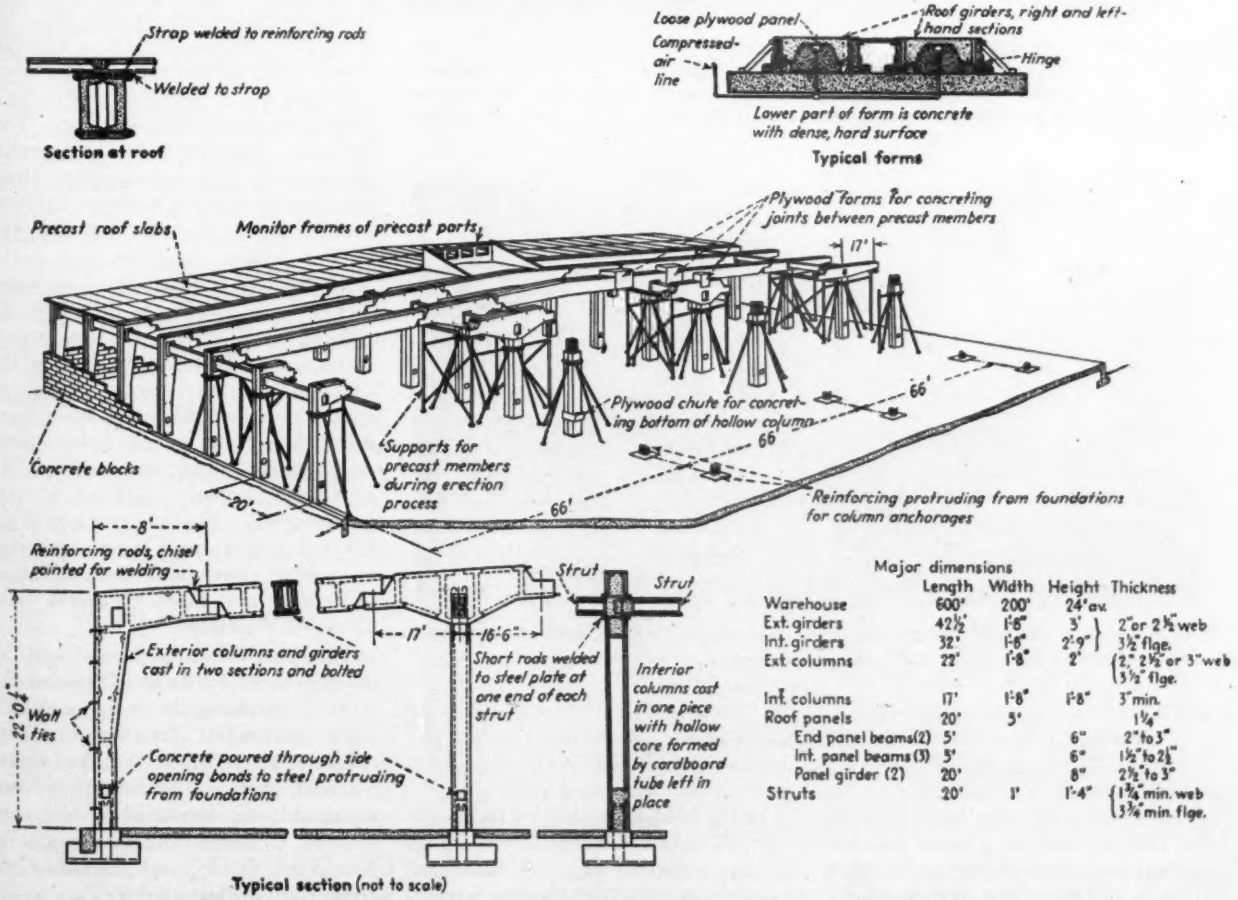


Fig. 2. Roof panels with exposed beams and girders that were precast integrally with slab span 20 ft. between precast rigid frames of hollow box section.

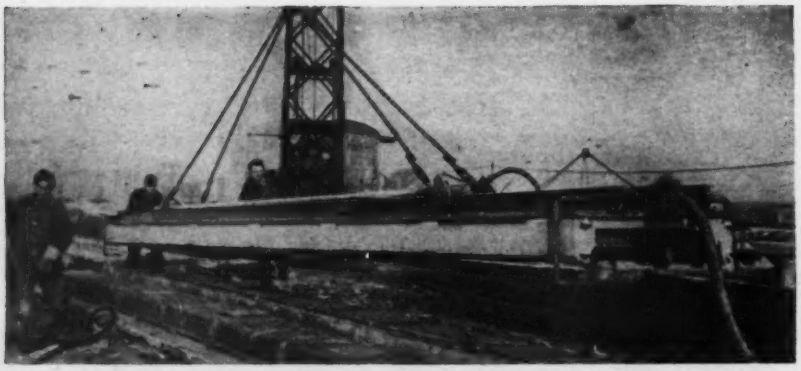
A crane handled the lifting pads. To raise a member, the pad was placed on it, the vacuum hose connected to a pipe protruding from the back of the pad, and the air between the facing and concrete surface partially exhausted. The crane then lifted pad and member almost as easily and quickly as a lifting magnet handles steel or iron. A vacuum of about 12½ in. of mercury was used, formed in a few seconds and easily maintained.

Pipes connected to vacuum pumps, run through the casting, storage and assembly yards, served not only to remove excess water from newly cast members, but also to energize the


Strap welded to reinforcing rods
Welded to strap
Section at roof
Loose plywood panel
Compressed-air line
Roof girders, right and left-hand sections
Hinge
Lower part of form is concrete with dense, hard surface
Typical forms
Precast roof slabs
Monitor frames of precast parts
Plywood forms for concreting joints between precast members
17'
Plywood chute for concreting bottom of hollow columns
66'
Concrete blocks
Supports for precast members during erection process
20'
Reinforcing protruding from foundations for column anchorages
8'
Reinforcing rods, chisel pointed for welding
Strut
Strut
17'
16'-6"
Exterior columns and girders cast in two sections and bolted
Short rods welded to steel plate at one end of each strut
Interior columns cast in one piece with hollow core formed by cardboard tube left in place
22'-0"
Wall ties
Concrete poured through side opening bonds to steel protruding from foundations
Typical section (not to scale)

Major dimensions	Length	Width	Height	Thickness
Warehouse	600'	200'	24' av.	
Ext. girders	42½'	1'-6"	3'	2" or 2½" web
Int. girders	32'	1'-6"	2'-9"	3½" flge.
Ext. columns	22'	1'-8"	2'	2", 2½" or 3" web; 3½" flge.
Int. columns	17'	1'-8"	1'-8"	3" min.
Roof panels	20'	5'		1¼"
End panel beams (2)	5'		6"	2" to 3"
Int. panel beams (3)	5'		6"	1½" to 2½"
Panel girder (2)	20'		8"	2½" to 3"
Struts	20'	1'	1'-4"	1¾" min. web; 3¾" min. flge.

Fig. 3. Methods employed in assembly and erection of the precast warehouse framing are illustrated in this schematic drawing.



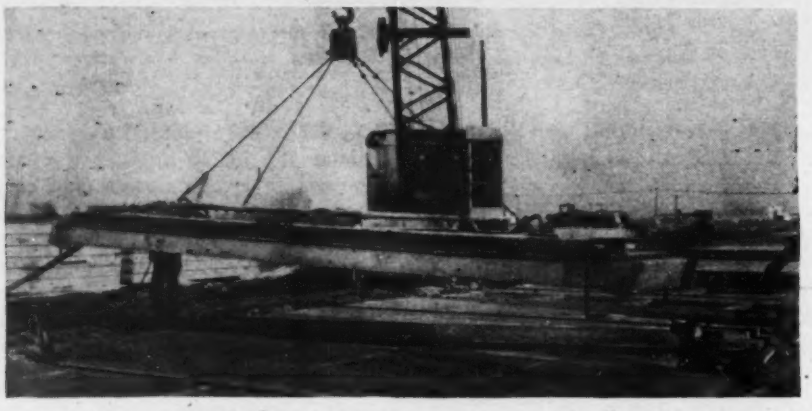


Fig. 4. Half of rigid-frame girder (top) was lifted from the form by a suction pad less than one day after casting and placed on its mate for bolting in storage yard. Roof slab (bottom) was similarly transported from forms to storage. Curved steel bars protruding from ends of suction pad were planned to catch member if suction should fail.

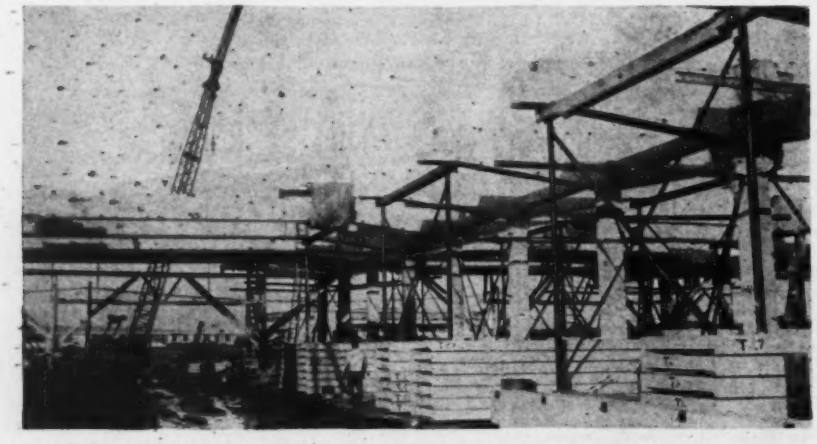


Fig. 5. Tubular steel scaffolding supported rigid frames during erection until concreted joint had hardened. Roof slabs were stored in warehouse area.

ingenious suction pads. When the precast members were lifted from the forms, a little compressed air was admitted through a pipe leading to the upper surface of each form to break the seal between its greased concrete surface and the member to be lifted from it. This unique method of lifting and handling precast concrete members in the casting, curing and assembly yards did much to expedite construction and lower costs.

In the actual erection of the buildings, all members were lifted by slings in the ordinary way. A crane set columns in place on concrete foundations from which reinforcing rods had been left protruding to provide anchorage (Fig. 3). These rods extended up into the hollow cores of the columns, which were temporarily braced and held vertical by steel struts, each of which was fitted with a turnbuckle to facilitate rapid and accurate plumbing of the columns. The lower ends of the columns were then filled with concrete which, when it set around the reinforcing steel, anchored them securely.

The T heads used on the interior columns and on the columns on the canopy sides of the warehouses were then similarly set and secured by pouring concrete into their central sections into which steel reinforcing rods extended from the upper ends of the columns. Each column head pour also tied an end of one of the horizontal struts connecting the building frames, the other end of the truss being fixed by bolting.

Precast box girders were then lifted into place, and reinforcing rods left protruding from them were welded to similar rods protruding from the concrete of the column caps. After the rods were welded, concrete cast in plywood forms around the joints between members of a bent connected them into a continuous rigid frame. This bestowed upon the bent the essential characteristics of a monolithic structure combined with extreme lightness and economy of both material and labor.

The precast roof panels of the warehouses were fastened in place by welding steel inserts to steel straps that had been bolted to the faces of the roof girders, the inserts themselves having been welded to the main reinforcement of the panels before these were poured. The monitors on the roof were similarly built up of precast members. The laying of a built-up felt and asphalt roof membrane over the precast panels and the installation of lighting and heating systems completed the building.

The warehouses were designed by the Bureau of Yards and Docks of the Navy Department, the designer principally responsible for their unusual characteristics being A. Amirikian. Unusual methods used in their construction were developed by the contractors, Corbetta Construction Co. of New York, N. Y., and Vacuum Concrete, Inc. of Philadelphia, Pa.

Notes on the Highway Research Meeting

***Editors Note**—Brief views of some of the needs in highway research are presented here in abstract form from papers delivered at the technical sessions of the recent annual meeting of the Highway Research Board. A news account of the meeting was given in the Feb. 7 issue of ENR, vol. p. 165.*

A REPORT on recent studies conducted by the Corps of Engineers at Eglin Field, Fla., disclosed several innovations in compacting sandy subgrades. Test sections contained an average 5-ft. thick top stratum of sand having a density between 85 and 90 percent of the maximum as determined by the modified AASHO compaction test. Compaction equipment ranged from an RD-8 tractor up to large earth moving equipment producing a 60,000-lb. wheel load. It was found that:

Addition of water by sprinkling or ponding does not add materially to the degree of compaction being obtained. Increase in density can be secured more easily by using a low number of coverages of a heavier load than by greatly increasing the number of coverages of a lighter load. Results indicate that after six coverages of any compacting unit, the benefit of additional coverages is slight.

Moderately light grading with the equipment normally used increases the density 7 percent in the top 2 ft. and 3 percent at 4 to 5-ft. depths, which is still considerably under the tentative requirements for very heavy bomber loads. It was proved that the Eglin Field subgrades could be compacted to the very heavy bomber requirements using wheel loads of the order of 35,000 lb.—F. A. ROBESON and PHILIP DAVIS, *U. S. Engineer Department, Mobile, Ala.*

Flexible pavement design

Recommendations of the Highway Research Board's Committee on Flexible Pavement Design included:

More and better soil surveys should be made and the mixing of soils and soil-aggregate mixtures should be done in mechanical devices capable of producing intimate mixtures.

Although compacting equipment now available is capable of producing satisfactory densification, a type of equipment which would compact soil mixtures in one pass not only would produce more uniform results but also would save considerable time and money.

In the preparation of subgrade more density should be required and greater thicknesses should be used since load carrying capacity can be attained most economically in this manner. In specifying the degree of density, more attention needs to be given to the strength of the compacted mixture, and eventually some strength index test should be used as the criterion for design.

Methods need to be developed for the determination of density in the laboratory so that field tests can be correctly correlated with them. And both the contractors and the field inspection personnel need to know more about the basic principles of soil compaction.—W. H. CAMPEN, *President and Manager, Omaha Testing Laboratories, Omaha, Nebr.*

Loads on Concrete Pavement

More experimental work is needed on the cost of subgrade compaction versus the cost of thickening concrete pavements. The quality of the subgrade has a relatively great effect upon pavement stress. This is particularly noticeable in the softer range of subgrades.

As the subgrade quality is built up, the decrease in stress becomes relatively less. A point will be reached eventually where the cost of subgrade

Tests to determine the effect of pounding on the compaction of sandy soils were conducted at Eglin Field, Fla. The tractor was loaded to weigh 80,000 lb.

improvement is out of proportion with the decrease in stress.

The total superimposed load is, of course, the greatest factor affecting pavement stress. The increase in contact area between tire and pavement, as the total load is increased, reduces the ratio between total load and stress from one-to-one to approximately six-to-five. In other words, doubling the total load increases the maximum pavement stress about 85 percent.

Increasing the pavement thickness is the most obvious method of reducing pavement stress. An increase in thickness of ½ in. will reduce the stress due to load by approximately 10 percent. The additional thickness is less effective as the pavements become thicker. One-half inch added to a 7-in. pavement decreases the stress by 11 percent, while ½ in. added to a 9½-in. pavement decreases the stress 8 percent. Either a reinforcement of the subgrade or an increase in pavement thickness will effect a decrease in pavement stress. The two factors should be compared as to their relative cost.—G. S. PAXSON, *Bridge Engineer, Oregon State Highway Department, Salem, Ore.*

Control of subgrade moisture

It is believed that the Buckingham capillary or pressure potential concept, first advanced in 1907, holds considerable promise for practical application to subgrade moisture problems, and it merits the attention of research workers and engineers engaged in the design and construction of highway and airport pavements, particularly those of the flexible type.

Supplementary to the studies which will be necessary to make practical applications of this concept, there is need for much more detailed information concerning actual subgrade moisture conditions and fluctuations. A great deal of value would accrue to state highway department and airport engineers if long time studies of moisture conditions, temperature fluctuations, groundwater-table fluctuations and capillary potentials of subgrade soils were made at permanent observation stations widely dispersed throughout the areas under their jurisdiction. To facilitate the procurement of these data, automatic instruments for recording temperatures, moisture content and capillary potentials at various depths in the soil need to be developed.—M. G. SPANGLER, *Research Professor of Civil Engineering, Experiment Station, Iowa State College, Ames, Iowa.*

Adequate offstreet parking

If cities are ever to catch up with their parking problem they should adopt an ordinance requiring that every new commercial building, regarded as a "traffic generator," provide adequate space for the parking of autos and loading and unloading of trucks. Adequacy would be defined in the law by a schedule—one parking or truck loading space for so many square feet of interior building space—varying with different types of buildings. This law would act at once to stop further aggravation of the problem by the construction of new commercial buildings.

If such an ordinance proves effective, a second ordinance should be adopted requiring existing buildings to make similar provisions within a 5- to 10-year period of grace. This would immediately induce ample provision for parking and truck loading space in business districts and at the same time, generate a wholesale rehabilitation of cities.—NATHAN CHERNIACK, *Economist, Port of New York Authority.*

Highway maintenance cost

Highway maintenance expenditures in this country approximate six-tenths of a billion dollars per year. They are of such magnitude as to emphasize the need of revaluing present maintenance practices, materials and equipment so as to insure the highest degree of economy and efficiency. Average costs of filling joints and cracks in concrete pavements range from ¼ to ⅝c. per lineal foot. These costs increase quite noticeably for pavement over ten years old. Machine methods are quite markedly more economical than hand operations, permitting savings up to 50 percent.

Patching of concrete pavements with bituminous materials costs from $0.25 to $1 per square yard. There are no satisfactory data as to the life of such patches. The cost of patching concrete with concrete ranges from $4 to $6.70 per square yard and work performed by state forces costs from 80 to 90 percent of that by contract.

Drilling holes in concrete pavement for mud-jacking costs from $0.07 to $0.23 per hole. Information on the cost of slurry, including pumping under the pavement, is meager; it probably is in the neighborhood of $10 per cubic yard. Information on the cost of pumping asphaltic mixtures under the pavement also is meager but it is probably around $0.12 per gallon.

Reports on shoulder maintenance are not conclusive, but one state reports the cost of maintenance of 8-ft. turf shoulders to be $94 per mile. This includes $19 for mowing, $50 for machining or rolling high places, and $25 for patching and seeding. The maintenance of crushed rock shoulders seems to be the most economical, ranging from $25 to $70 per mile.

An analysis of maintenance expenditures over a period of years on representative sections of road discloses that on the average, 45 percent of the expenditures are made for direct labor, 21 percent for materials, 25 percent for equipment, and 9 percent for overhead.—J. S. BRIGHT, *Deputy Commissioner, PRA, Washington, D. C.*

Highway maintenance personnel

Trained workmen will continue to pay high dividends in efficiency and quality of workmanship in the peacetime maintenance of highways regardless of how plentiful workers may become. Much time and money have been spent in research to improve material and machinery. It is high time that research work be done with men.

Probably as important as any one factor is the employee's desire for assurance in retaining his job in return for satisfactory service. Sixteen states have assured their employees of continuity of service by the adoption of a civil service system.

Equally important is the payment of fair wages and salaries, which can be accomplished best by a job evaluation plan. Of the four basic systems of job evaluation, known generally as the ranking system, the classification system, the point system, and the factor-comparison system, the latter two are believed to be the most satisfactory in evaluating the jobs in a state highway department.

A retirement plan is another item that is very desirable to the wage and salary earner and fits into his idea of economic security. Employees of 21 states now have the advantage of such a plan. All of the states not now having a plan report that it would be desirable.—REX M. WHITTON, *Maintenance Engineer, Missouri State Highway Department, Jefferson City, Mo.*

Construction Costs—1946

Each year *Engineering News-Record* compiles current data for measuring trends in construction and building costs, materials prices and labor rates. This 1946 edition highlights the important changes reflected by the transition from a war to a peacetime economy. Of special interest are the cost indexes, which provide the means for making comparative studies on the basis of past experience, and new data on housing cost evaluation.

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AN ENGINEERING N[illegible] FEATURE

Housing Construction Cost Study Sets up New Yardsticks for Comparison

Contents in Brief—A committee appointed by the New York City Housing Authority has developed a measure of such factors as privacy, space, light and air provided in multiple family housing in relation to construction cost. On this basis comparison was made of the cost of private investment and limited-dividend housing construction with that of the housing authority projects in New York City. Costs per apartment (as of 1940) ranged from $2,623 to $4,143; cubic foot costs from 38c. to 53c.; cost per construction room from $711 to $1,256; cost per person housed from $802 to $1,712; and cost per square foot of rentable area from $.65 to $6.71.

RELATIVE COSTS and amenities of public and of private housing have been for a long time the subject of controversial discussion. In the belief that proponents of both types have obscured facts by misplaced zeal, the New York City Housing Authority, of which Edmond B. Butler is chairman, decided that a substantial contribution to constructive thinking could be made by an impartial analysis of construction costs.

With this in mind, the authority appointed a special committee, consisting of the architectural firm of Voorhees, Walker, Foley & Smith (represented by Perry Coke Smith, a partner of the firm); the contracting organization of the Turner Construction Co. (represented by John P. H. Perry, vice-president); and the New York City Housing Authority (represented by John P. Riley, director of development for the authority). This committee was authorized to make a comparative study of representative and similar projects built by the New York City Housing Authority under federal financing, of limited-dividend projects built under the laws of the State of New York governing such work, and of low-rental housing built by a large institutional investor. The Federal Public Housing Authority cooperated with the New York City Housing Authority in carrying out this study.

Purpose of this study was not an attempt to evaluate the relative merits of the over-all living conditions at one project as compared with another. Neither did it seek to determine type of construction or design as compared with another, or even to determine the relative over-all economies of one project as compared with another.

Major objectives were to reduce to a common cost-denominator the ascertainable and comparable features of construction, to accompany these analyses with descriptions of the comparable physical characteristics of the projects, and to show the living conditions resulting from such physical characteristics.

Facts not opinions

To seek to do more than this, the committee decided, would defeat the very purpose of the study in that it would depart from non-controvertible data, would interject personal opinion (as distinguished from fact), and would wreck the study on the same rock on which have foundered so many discussions of this question.

Projects were selected from each of the three groups having characteristics of size and living facilities, comparable to the projects considered in the other groups.

Chosen as representing limited-dividend projects were (1) Knickerbocker Village—a thirteen-story, elevator-type project, housing 1,587 families; (2) Hillside Homes—a predominantly four-story, walk-up type project, housing 1,411 families; and (3) Boulevard Gardens—a six-story, elevator-type project, housing 954 families.

With the cooperation of a large institutional investor, two of its projects in the New York metropolitan area were chosen: (1) Private Project "A", a five to six-story, walk-up type project, housing 374 families, and (2) Private Project "B", a five to six-story, walk-up type of project, housing 381 families.

The New York City Housing Authority projects selected were: (1) South Jamaica Houses—a three and four-story, walk-up project, housing 448 families; (2) Kingsborough Houses—a six-story, elevator-type project, housing 1,166 families; (3) East River Houses—a six to eleven-story, elevator-type project, housing 1,170 families.

These three authority projects were selected primarily because they were built during normal construction conditions, were of character and size

TABLE I—NEW YORK CITY HOUSING AUTHORITY PROJECT COSTS

Project		Cost (adjusted to 1940)					
		Per		Per Construction		Per	
Elevator-type fire-proof	Families	Person	Rank	Room	Rank	Apt.	Rank
Vladeck Houses	1,771	$1,119	(1)	$834	(2)	$3,042	(2)
Red Hook Houses	2,545	1,001	(2)	915	(1)	3,372	(1)
Queensbirdge Houses	3,149	905	(3)	827	(3)	2,988	(3)
Wallabout Houses	207	899	(4)	706	(7)	2,604	(7)
Kingsborough Houses	1,166	866	(5)	753	(4)	2,687	(5)
East River Houses	1,170	802	(6)	711	(6)	2,623	(6)
Fort Greene Houses	3,501	723	(7)	717	(5)	2,694	(4)
Walk-up							
South Jamaica Houses	448	$1,046	(1)	$939	(1)	$3,286	(2)
Clason Point Gardens*	400	845	(2)	813	(2)	3,421	(1)

*Fireproof except roof framing.

comparable to the other projects studied, and were typical of the major portion of the authority's work. Although the committee's report does not cover other projects of the New York City Housing Authority, it is interesting to see how closely these other projects compare in costs with the specific ones studied.

Shown in Table I is a comparison of East River and Kingsborough Houses, on the basis established in the report and on 1940 price factors, with the costs for all other elevator-type, fireproof apartments built by the authority. It also compares South Jamaica Houses, the only walk-up type project built by the authority included in the report, with the only other comparable authority project, Clason Point Gardens, a row-house type project, which is of fire-proof construction except for the roof framing. South Jamaica Houses was chosen because it is of fire-proof construction throughout, and is more nearly comparable to this type of housing as built by others.

Complete sets of plans and specifications, together with actual construction cost data, were obtained and made available to the members of the committee and their respective staffs.

Cost figures for New York City Housing Authority projects were taken from the audited cost reports of the authority. For the limited-dividend projects cost records of the New York State Division of Housing were used. For the private projects cost data were obtained from the records of the owner.

Specifications were condensed to outline form for ready reference, and to show as briefly as possible the comparable and salient characteristics. Working plans were studied and comparable quantities were ascertained for the various features of the buildings.

Time: In order to adjust the costs to a common time base, the year 1940 was chosen as the most recent normal year in construction. By averaging cost indexes of *Engineering News-Record*, Aberthaw, Austin, Fruin-Colnon, Fuller and Turner (as reported elsewhere in this issue) relative cost index averages for the several years involved were established as shown in Table II.

Cost Elements Excluded: In setting up these costs, the costs of general excavation as well as that for all foundation work such as excavation, masonry, piling, etc., below the top of footings under foundations were excluded, so that any variables resulting from soil and site conditions would not distort the analysis. Where actual cost breakdowns for these items could not be determined from cost data furnished to the committee, quantities were actually computed and fair units of price established by joint agreement of the committee.

Land costs were not included in the study or the comparisons, nor did the committee attempt to compare locations, ground coverage, recreation facilities, densities of population and other physiological and sociological aspects. Neither were comparisons made as to the relative safety of fireproof versus non-fireproof structures, or the relative merits of finish, closet arrangements and the like. The committee decided that to venture on such comparisons would obscure the basic purpose of the study.

Units of measurement defined

Since comparison of structures solely on the basis of cost per cubic foot of volume is meaningless unless the structures compared are of the same type of construction, the committee decided to study other bases of unit cost comparison and selected several other "yardsticks".

These bases, which represent amenities of living, are:

Privacy—Measured by the number of rooms per person.

Space—What might also be termed "elbow-room", the space provided per person is measured in two ways—by square feet of rentable area, and by cubic feet of rentable space.

Light and air—In this study these amenities are measured only by the square feet of exterior wall provided per person. Obviously, site planning and percentage of site coverage are factors but, for reasons previously stated, they are not considered in this study.

The ratio of rentable area to gross area may be considered by some to be a criterion of efficiency of design. The committee did not believe, however, that this factor alone can be used as a measure of design efficiency. Attention is called to Table IV, where cases occur in which the ratio of rentable area to gross area is substantially the same for two projects, although the rentable area per person varies by a considerable percentage for these same projects. It is obvious that if two projects have the same non-rentable area and the same number of rooms, the one with the larger rooms (rentable area per person) would show the higher ratio of rentable to gross area.

In both tables and text, a "construction room" is defined as an enclosed space for private occupancy (having one or more windows) designed to be used as living room, bed room, or kitchen. All kitchen and dining spaces whether separated or not are combined to equal one construction room unless the dining space is of such size and is so located that it can be legally used as another room, in which case it may be counted as a construction room. Bath rooms, and closet spaces are not considered as construction rooms or parts thereof. No half rooms are considered.

For the three yardsticks, the variations among the projects are:

1. Number of rooms per person (privacy) ranged from 1.10 rooms for Hillside Homes to 1.39 rooms for Private Project "B".

2. Square feet of rentable area per person range from 168 sq. ft. for South Jamaica Houses to 258 sq. ft. for Knickerbocker Village. Cubic feet of rentable space per person range from

TABLE II—COST INDEX AVERAGES USED BY COMMITTEE

Year Base 1913=100	Cost Index Average*	Year Base 1913=100	Cost Index Average*	Year Base 1913=100	Cost Index Average*
1929	191	1935	166	1941	210
1930	183	1936	172	1942	227
1931	166	1937	192	1943	233
1932	150	1938	189	1944	234
1933	152	1939	187	1945 Nov.	241
1934	166	1940	193		

*Average of the Aberthaw, Austin, Engineering News-Record, Fruin-Colnon, Fuller and Turner cost indexes.

Of the individual indexes studied, it is interesting to note that the *Engineering News-Record* building cost index ran consistently closest to the average of all six indexes, holding this median position during nine of the eighteen years, with Aberthaw closest two years, Fruin-Colnon two years, Fuller two years and Turner three years. The *ENR* building cost index varied from the average a maximum of 6 percent below in 1932 and 5 percent above in 1939 and 1940. It varied from the average 2 percent or less, plus or minus, during twelve of the enghteen years studied.

Table III—HOUSING CONSTRUCTION

Analysis shows floor space, volume of space and

Quoted by permission from "Construction Cost Analysis".

Project, Location, Ownership	New York City Housing Authority			Private Investment Housing	
	East River Manhattan	Kingsborough Brooklyn	South Jamaica Queens	Project "A" Metropolitan Area	Project "B" Metropolitan Area
I. A. Total cost of building, excluding excavation—footings—adjusted to 1940	**$3,069,184**	**$3,133,100**	**$1,472,274**	**$992,797**	**$956,747**
B. Number of Buildings	10—Fireproof	16—Fireproof	11—Fireproof	6—Fireproof	6—Fireproof
C. Number of Stories	6-10-11	6	3-4	Four at 5, Two at 6	Four at 5, Two at 6
D. Floor to Floor Height	8'-6"	8'-6"	8'-6"	8'-8½"	8'-8½"
II. Unit cost (Based on total cost of Building, Excl. Excavation & Footings) Adjusted to 1940					
A. Cost per Apartment	$2,623	$2,687	$3,286	$2,655	$2,511
B. Cost per Cubic Foot	.38	.39	.50	.51	.45
C. Cost per Construction Room	711	753	939	880	812
D. Cost per Person Housed	802	866	1,046	1,153	1,126
E. Cost per Square Foot Rentable Area	4.65	4.79	6.22	6.71	5.95
III. Space Provided					
A. Apartments	1,170	1,166	448	374	381
B. Construction Rooms	4,316	4,163	1,568	1,128	1,178
C. Persons Housed	3,826	3,617	1,408	861	850
D. Rooms per Person	1.13	1.15	1.11	1.31	1.39
E. Gross Floor Area ..... square feet	809,435	775,674	284,456	180,350	196,320
F. Rentable Area ..... square feet	660,672	653,604	236,692	147,960	160,680
G. Gross Floor Area per Person ..... square feet	212	214	233	209	231
H. Rentable Area per Person ..... square feet	173	181	168	172	180
I. AIA Cube ..... cubic feet	7,963,515	8,037,853	2,940,659	1,949,700	2,077,800
J. Rentable Volume ..... cubic feet	5,285,376	5,228,832	1,940,847	1,286,000	1,395,000
K. Rentable Space per Person ..... cubic feet	1,381	1,446	1,378	1,494	1,641
L. Rentable Volume per Apartment ..... cubic feet	4,517	4,448	4,332	3,439	3,661
M. Area, Exterior Wall ..... square feet	506,141	522,206	193,015	134,000	143,500
N. Exterior Wall per Person ..... square feet	132	141	137	156	169
O. Ratio Rentable to Gross Area ..... %	82	84	83	82	82
P. Rentable Volume per AIA Cube ..... %	66	65	66	66	67
IV. A. Date of Award of Construction Contract	May 14, 1940	Sept. 6, 1940	Sept. 22, 1939	Mar. 3, 1933	July 18, 1934
B. Total cost of Building, excluding excavation—footings, when built	**$3,069,184**	**$3,133,100**	**$1,426,483**	**$781,915**	**$822,937**
V. Distribution of Cost					
A. Primary Cost Determinants—Basic Features (Excavation & Footings Excluded)	Percent of Total Cost IV B %	Percent of Total Cost IV B %	Percent of Total Cost IV B %	Percent of Total Cost IV B %	Percent of Total Cost IV B %
Type of Construction and Prevailing Practice					
1. Concrete Foundations, Concrete Frame, Concrete Arches	24.3 1a	25.8	27.1	22.3	20.1
2. Walls & Partitions, Brick & Back-up Tile	14.3	14.5	14.8	17.6 2a	21.3 2b
3. Waterproofing (WP) Dampproofing (DP) Spandrel W'' (SpWP)	0.4 SpWP	0.5 SpWP	0.2 SpWP	1.3 3a	0.4 3b
4. Windows, Steel Casements, Caulked	3.1	2.9	2.8	0.5 4a	0.5 4a
5. Roofing, 4-ply-20-yr.-Celotex Insulation	0.9	1.1	2.1	2.4 5cde	2.2 5cde
6. Metal Bucks For Interior Doors	1.1 6a	1.0 6a	1.0 6a	1.3	1.5
7. Kalamein Apartment Entrance Doors	0.6	0.5	0.6	0.9 7b	0.6
8. Iron Stairs	2.8 8a	1.6 8a	2.8 8a	4.2 8bc	3.1 8bc
9. Incinerators	0.1	0.1	0.3	0.1 9b	0.7 9c
10. Metal Furring, Lath & Base	4.8	4.5	4.8	— 10bc	None
11. Plastering, 2-in. solid partitions, none on ceiling	5.6	5.1	5.4	4.9 11a	5.1 11d
12. Bath Rooms, Tile Floor & Base	0.6	0.6	0.6	1.5	0.9
13. Floor Finish, Asphalt Tile	1.6	1.7	1.4	3.3 13d	4.1 13d
14. Carpentry, Wood Interior Doors, Kitchen Cabinets	3.5	3.6	4.5	8.7 14b	8.7
15. Glazing, "B" Quality sa & ds	0.7	0.5	0.5	— 15d	— 15d
16. Hardware, Parkerized Finish	0.5	0.5	0.5	0.6 16d	0.6 16c
17. Painting, Two-coat	2.8	2.9	3.1	3.4 17c	3.4 17d
18. Heating, Vacuum steam-oil fired	6.4	6.8	7.6	6.1	4.7
19. Elevators, Number of elevators shown in ( )	4.7 (29)	4.3 (35)	None	None	10b, 10d
Total Cost Percentage in Basic Features	**78.9**	**78.5**	**80.2**	**79.1**	**77.9**
B. Secondary Cost Determinants—Influenced by owner's desires.					
20. Plumbing—Roughing, Brass piping	8.4	9.2	8.6	12.8 20a	12.9 20ac
21. Plumbing—Fixtures, Enamel on cast iron	4.0	3.8	4.0	— 21a	— 21a
22. Electric—Wiring & Conduit, Switches, Ceiling Outlets, Receptacles	4.9 22a	5.0 22a	3.9 22a	2.3	3.4 22b
23. Electric—Fixtures, Porcelain, Stamped Brass	0.7	0.5	0.5	0.4 23ad	— 23ad
24. Screens, Window, Metal	0.013	0.016	0.041	0.3 24a	0.6 24a
25. Shades, Window, Holland Cloth	0.3 25a	0.2 25a	0.2 25a	0.2 25c	0.2 25c
26. Gas Ranges, 4 Burners, Low Oven	0.8	0.8	0.7	1.3 26d	1.3 26e
27. Refrigerators, Electric, 4 cu. ft.	2.0	2.0	1.9	3.6 27c	3.7 27c
Total Cost Percentage	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

COSTS IN NEW YORK CITY

exterior wall space in relation to construction cost.

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	Limited Dividend Housing		
	Boulevard Gardens Queens	Hillside Houses Bronx	Knickerbocker Village Manhattan
I. A.	**$3,334,646**	**$4,893,093**	**$6,574,858**
B.	10—Non-Fireproof	5—Fireproof	2—Fireproof
C.	6	4, part of one 6	13, part of one 9
D.	9′–4 7/8″, 9′–6 3/8″	9′–2″	9′–0″
II.			
A.	$3,495	$3,468	$4,143
B.	.38	.42	.53
C.	1,008	989	1,256
D.	1,283	1,087	1,712
E.	5.17	5.17	6.63
III.			
A.	954	1,411	1,587
B.	3,309	4,948	5,235
C.	2,600	4,500	3,840
D.	1.27	1.10	1.36
E.	758,926	1,205,136	1,219,893
F.	645,013	945,855	991,675
G.	292	268	318
H.	248	210	258
I.	8,708,095	11,692,754	12,456,238
J.	5,381,564	8,238,971	8,020,507
K.	2,069	1,831	2,089
L.	5,641	5,839	5,054
M.	474,581	755,323	720,492
N.	183	168	188
O.	85	78	81
P.	62	70	64
IV. A.	Dec. 19, 1933	April 19, 1934	Oct. 10, 1933
B.	**$2,626,326**	**$4,280,750**	**$5,178,277**
V.			
A.	Percent of Total Cost IV B %	Percent of Total Cost IV B %	Percent of Total Cost IV B %
1.	7.6 1b	18.0 1c	24.0 1c
2.	18.8 2c	21.3 2d	20.0 2de
3.	In Roofing 3c	0.6 3d	0.8 3e
4.	0.3 4b	2.9	0.4 4c
5.	0.7 5a	1.2 5bc	0.6 5bdf
6.	1.8 6b & 7a	2.0 7a	3.7 7a
7.	— 7a	— 7a	— 7a
8.	1.9 8b	1.4	0.7
9.	0.1	0.1	0.1 9a
10.	— 10ab	None	None
11.	11.8 11a	10.4 11b	7.6 11c
12.	3.6 12a	0.8	1.5
13.	3.9 13a	4.0 13b	2.8 13c
14.	15.4 14a	3.5	4.7
15.	In Windows 15a	0.5 15b	0.2 15c
16.	0.8 16a	0.5 16b	0.8 16c
17.	3.9 17a	2.8 17b	2.9 17a
18.	5.4 18a	7.8	5.9 18b
19.	3.3 (20)	0.4 (2)	3.1 (24)
	79.3	**78.2**	**79.8**
B.			
20.	12.5 20a	11.7 20a	12.3 20ab
21.	— 21ab	— 21a	— 21a
22.	3.1	5.4	4.4
23.	0.6 23a	0.4 23ab	0.5 23c
24.	None	In Windows	None
25.	0.8	0.9 25b	0.1
26.	0.9 26a	0.8 26b	0.7 26c
27.	2.8 27a	2.6 27b	2.2
	100.0	**100.0**	**100.0**

Variations from Practice or Product Prevailing in This Group of Eight Projects

1a also concrete stairs
1b structural steel frame, wood beams, concrete first floor
1c structural steel frame
2a 8-in. clay block, terra cotta furring, gypsum partition
2b 10-in. clay block walls, gypsum partitions
2c 12-in. solid brick walls (wood stud partition)
2d 12-in. solid brick bearing walls
2e gypsum and terra cotta partition
3a SpWP, Membrane WP
3b SpWP, Membrane WP Tunnels and Boiler vault
3c DP Stairwalls, SpWP at windows
3d DP exterior walls, WP Boiler room no SpWP
3e DP exterior walls, WP Boiler room, SpWP
4a caulking, window sills, wood windows in carpentry
4b caulking, weatherstripping, wood windows in carpentry
4c wood windows, caulked and window sills
5a 5-ply gravel
5b 5-ply, 10-yr.
5c 1-in. cork insulation
5d tile on promenade roof
5e 4-ply, 10-yr.
5f insulation, type not specified
6a metal bucks and partition ends
6b also trimmed openings
7a Kalamein apartment entrance doors included in item 6
7b also Kalamein penthouse doors and frames
8a Pan type
8b Also fire escapes
8c also slate tread
9a also ash hoist
9b includes masonry and garbage elevator
9c also garbage hoists, dumbwaiters
10a wood furring, metal lath
10b included with 11
10c terra cotta ext. wall furring in masonry
10d no exterior wall furring
11a gypsum plaster walls and ceilings
11b plaster on mastic, 2-in. plaster partition, brown coat on ceilings
11c plaster on mastic, plaster ceilings
11d Ext. walls, sand, cement and WP
12a also wainscot
13a oak strip
13b wood blocks on mastic
13c wood
13d oak panels in mastic
14a also wood beams
14b also wood ext. doors, wood windows
15a sheet glass ss Grade "A"
15b sheet glass as Grade "B"
15c sheet glass ss Flat drawn
15d first quality double thick, included with 14
16a brass, chrome or other plate
16b wrought brass
16c bronze
16d cast brass
17a also primer
17b also sealer
17c sized and one-coat washable paint
17d sized and one-coat "Sunflex"
18a low pressure steam, oil fired
18b two-pipe, up-feed, low pressure
20a includes fixtures
20b hot-brass, cold to 2½-in.-brass, balance galvanized wr. iron
20c also Murphy kitchen
21a included in 20
21b also ceramic
22a wall brackets instead of ceiling outlets
22b includes fixtures
23a spun brass
23b enameled
23c cast metal
23d and porcelain
24a wood frame screens
25a Pyroxylin impregnated cloth
25b kind not specified
25c sunfast
26a 36-in. tabletop and 24-in. pedestal type
26b type not shown
26c side oven
26d high oven on legs
26e table top and Murphy
27d some 3 cu. ft.
27e size not shown
27c and Murphy cabinet type

NOTES, DEFINITIONS AND ABBREVIATIONS

A I A CUBE: Actual space enclosed within the outer surfaces of the outside or enclosure walls and contained between the outer surfaces of the roof and six inches below the finished surfaces of the lowest floors. The above definition requires the cube of dormers, pent houses, vaults, pits, enclosed porches and other enclosed appendages to be included as part of cube of building. It does not include the cube of courts or light shafts open at the top, or the cube of outside steps, cornices, parapets, or open porches or loggias. Where there are pipe spaces and no cellar spaces below first floor, cube is to be taken to six inches below first floor.

CONSTRUCTION ROOM: A construction room is an enclosed space for private occupancy (having one or more windows) designed to be used as living room, bed room or kitchen. All kitchen and dining spaces, whether separated or not, are combined to equal one construction room, unless the dining space is of such size and is so located that it can be legally used as another room, in which case it can be counted as a construction room. Bath rooms and closet spaces are not considered as construction rooms or parts thereof. No half rooms are considered.

RENTABLE AREA: Area within the apartments or stores measured to the outside face of walls, partitions and columns.

RENTABLE VOLUME: Rental area times ceiling height.

GROSS FLOOR AREA: Total of gross area of all floors to outside of walls except roofs, stair and elevator enclosures on roofs and basements

WP Water proofing
DP Damp proofing
SpWP Spandrel water proofing
ss single strength
ds double strength

TABLE IV—PRIVACY, SPACE, EXPOSURE AND COST COMPARISONS

East River Houses (E. R.) Used as Base = 1.00

Projects	Stories	Elevator or Walk-Up	Privacy: Rooms per person		Space: Rentable area per room		Space: Rentable area per person		Volume: Rentable volume per person		Exposure: Exterior wall per person		Ratio: Rentable area to gross area		Total Adjusted Cost to 1940 (Excluding Footings): Per person		Per cu. ft. based on A.I.A. cube		Per sq. ft. rentable area	
			Rms.	%E.R.	Sq. ft.	%E.R.	Sq. ft.	%E.R.	Cu. ft.	%E.R.	Sq. ft.	%E.R.		%E.R.		%E.R.		%E.R.		%E.R.
East River	6-10-11	E	1.13	1.00	153	1.00	173	1.00	1,381	1.00	132	1.00	0.816	1.00	$802	1.00	$.38	1.00	$4.65	1.00
Kingsborough	6	E	1.15	1.02	157	1.03	181	1.05	1,446	1.05	144	1.09	0.843	1.03	866	1.08	.09	1.03	4.79	1.03
South Jamaica	3-4	W	1.11	0.98	151	0.99	168	0.97	1,378	0.99	136	1.05	0.832	1.02	1,046	1.30	.60	1.32	6.22	1.34
AVERAGE			1.13		153.7		174		1,402		138		0.830		905		.42		5.62	
Private Project "A"	5-6	W	1.31	1.16	131	0.86	172	0.99	1,494	1.08	156	1.18	0.820	1.00	1,153	1.44	.51	1.34	6.71	1.44
Private Project "B"	5-6	W	1.39	1.23	136	0.89	189	1.09	1,641	1.19	169	1.28	0.818	1.00	1,221	1.52	.50	1.32	6.46	1.39
AVERAGE			1.35		133.5		180.5		1,567.5		162.5		0.819		1,187		0.505		7.59	
Boulevard Gardens	6	E	1.27	1.12	195	1.27	248	1.43	2,069	1.50	183	1.39	0.850	1.04	1,283	1.60	.38	1.00	5.17	1.11
Hillside	4-6	W	1.10	0.97	191	1.25	210	1.21	1,831	1.33	168	1.27	0.785	0.96	1,087	1.36	.42	1.11	5.27	1.11
Knickerbocker	9-13	E	1.36	1.20	189	1.24	258	1.49	2,089	1.51	188	1.42	0.813	0.99	1,712	2.13	.53	1.39	6.63	1.43
AVERAGE			1.24		192		239		1,996		179		0.816		1,360		.44		5.66	

1,378 cu. ft. for South Jamaica Houses to 2,089 cu. ft. for Knickerbocker Village.

3. Square feet of exterior wall per person (light and air) range from 132 sq. ft. for East River Houses to 188 sq. ft. for Knickerbocker Village.

Primary and secondary determinants

It became apparent, as the study progressed, that certain features of a building are basic, such as the structural skeleton and certain generally accepted features of the finished structure which are primary determinants of cost. A cost analysis was made first on this basis, using the items shown under items V-A, 1 to 19 in Table III.

The remaining items of cost V-B, 20 to 27 inclusive, were segregated. These are items that do not affect the primary design (or skeleton) and are influenced more by owners' taste than by structural quality or need. For example, the cost of the electrical system depends upon the owners' desire as to number and quality of electrical fixtures. The decorative treatment of a bathroom is distinct from its structural features. The quality of window shades has nothing to do with the structural qualities of a building, or the relative merits of a living space as regards light, air, safety and sanitation. These items are tabulated, therefore, as secondary.

The prevailing characteristics in the specifications governing these eight projects are shown in Table III, together with a schedule of variations as they occur.

Primary costs of basic features, in accordance with these definitions, account for 77.9 percent of the total cost of Private Project A compared with the other extreme, 80.2 percent of the total cost of New York City Housing Authority's South Jamaica Houses.

The largest single cost unit is for foundations, which ranges in the fireproof construction from 18 percent for Hillside Houses (structural steel frame, concrete foundations) to 25.8 percent for Kingsborough (concrete foundations, concrete frame). Boulevard Gardens, non-fireproof, charges 7.6 percent of total cost to concrete foundations, concrete first floor, structural steel frame and wood beams but has 15.4 percent charged to "Carpentry", compared with 3.5 percent to 8.7 percent to "Carpentry" for other projects.

Walls and partitions take from 14.3 percent to 20.3 percent of total cost.

A detailed analysis of 27 cost elements is shown in Table III, together with a complete record of unit costs.

This study shows that houses built around a compact central core achieve lower unit costs than row-type houses.

It shows also that elevator apartments can produce lower unit costs than walk-ups, by reducing stair and hall areas in relation to rentable area.

The range of cost for each type of analysis was as follows:

1. Cost per apartment ranged from $2,623 for East River Houses to $4,143 for Knickerbocker Village.

2. Cost per cubic foot ranged from 38 cents for East River Houses and for Boulevard Gardens to 53 cents for Knickerbocker Village.

3. Cost per construction room ranged from $711 for East River Houses to $1,256 for Knickerbocker Village.

4. Cost per person housed ranged from $802 for East River Houses to $1,712 for Knickerbocker Village.

5. Cost per square foot of rentable area ranged from $4.56 (East River Houses) to $6.71 (Private Project "A".)

The over-all merits of a project, in any study of construction costs, are most simply judged by the achievements in economy, privacy, space provided and safety. The projects chosen for comparison were all efficiently and economically constructed, but they emphasized these aforementioned aspects in varying degrees.

If, for example, the prime consideration is the achievement of fireproof construction with reasonable adequate provisions of space and privacy, at the lowest possible cost, then East River Houses comes nearest to the goal. If, on the other hand, privacy is valued more than economy, then Private Project "A" comes nearest to the goal. If minimum cost and greatest privacy are not so much desired as most space within a reasonable cost limitation, then Knickerbocker Village meets this requirement best.

Thus it can be seen that no one project can be selected as meeting all these standards best or as having produced all standards most cheaply, and it is for this reason that no over-all comparison has been attempted. The committee concludes that it could not discover a mathematical pattern that would relate the merits of facilities and amenities provided to the cost of producing them and, therefore, stopped its study at this line of demarcation.

Building Labor Productivity

BUILDING CONSTRUCTION labor productivity in areas centering in 18 cities, reported to *Engineering News-Record* for the first quarter of 1946, ranges from 40 to 100 percent of 1939 productivity for skilled labor with a median of 65 percent, and from 30 to 100 percent for common labor with a median of 68 percent. Where lower efficiencies are experienced, the reasons most frequently cited are "the labor shortage", and "lack of interest".

Productivity varies not only from one area to another, but within the areas and from one trade to another. This study by *Engineering News-Record*, made with the cooperation of 54 building contractors in 18 metropolitan areas, shows, for example, that skilled labor productivity ranges from a minimum of 40 (based on 1939 = 100) in Kansas City to 100 in Boston, but that in Kansas City the range is from 40 to 85 with a median of 70, compared with the 18-cities median of 65 on building construction.

FORMULA FOR COMPUTING CHANGES IN LABOR PRODUCTIVITY

	1939 Scale	1946 Scale		
Carpenter	$1.50,	$1.70,	increase	.20
Masons	1.75,	1.90,	"	.15
Iron Workers ..	1.75,	1.90,	"	.15
	$5.00	$5.50		.50=10%

Work costing $1.00 in 1939 now costs.....$1.50
Whereas it should cost only 10% more or.... 1.10

Loss in efficiency.....$ .40

$\frac{110}{150}$ = 73% Efficient

Common labor productivity on building construction varies from a minimum of 30 in New Orleans to 100 in Boston. The widest intra-area range is in Detroit where a minimum of 50 and a maximum of 85 are reported with a median of 62 that compares with the 18-cities median of 68.

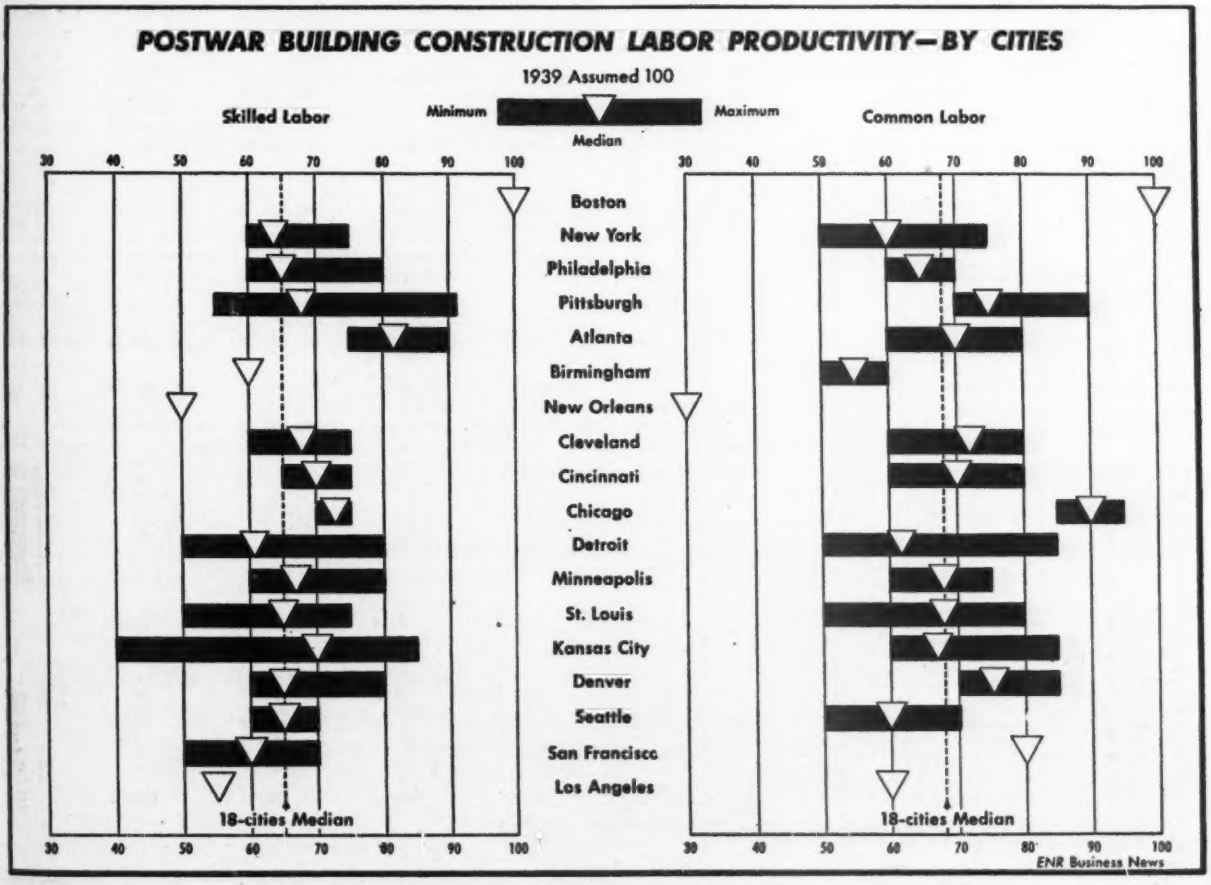
The accompanying formula for computing labor productivity change from 1939 was suggested by a St. Louis contractor to take this important factor in construction cost estimating out of the realm of opinion and into the actual records of the job.

It is widely recognized that many of the conditions that cause these lower efficiencies of construction labor are due to the change-over from war to peacetime working conditions and are subject to correction as more men and materials become available.

Where construction labor productivity is lower than before the war, contractors assign these reasons:

	Percent of Companies Reporting
Labor shortage	66
Lack of interest	56
Workers new to construction	34
Feather bedding rules	31
Union work quotas	25
Workers new to contractors organization	19
Average age of trade men abnormally high	16
Shortage of materials	9
Hold over from over manning of war work	6
Absenteeism	6
Jurisdictional troubles	3
Doing work with higher scale crafts —as carpenters wrecking forms..	3

For additional data see page 67.



Construction Accounts for 69 Percent of

Large-project public housing notably is subject to wide variation in per-room and per-dwelling unit cost. Further evidence of this is provided in an analysis of cost allocations in 14 New York City developments, which is contained in the *10th Annual Report* of the New York City Housing Authority (1944), based on a summary of development costs as of December 31, 1943.

Representing a total investment of $90,000,000, the projects are compared in detail as to distribution of capital cost between site cost and construction cost, as to land use, and as to shelter facilities provided. The data in the accompanying table are abstracted from this report of the Housing Authority.

Grouped together, construction costs for all 14 projects amounted to 69 percent of the total expenditure, site costs 25 percent, site improvement 2

HOUSING PROJECT Source of Development Funds	First Houses CWA-PWA TERA and Private ERB	Williamsburg PWA	Harlem River PWA	Red Hook Private and USHA	Queensbridge Private and USHA	Vladeck Private and USHA
LOCATION, Borough	Manhattan	Brooklyn	Manhattan	Brooklyn	Queens	Manhattan
CONSTRUCTION PERIOD	1935-36	1936-38	1936-37	1938-39	1938-40	1939-40
DEMOLITION STARTED	Nov. 1, '34	Feb. 10, '35	Vacant Land	June 11, '38	Aug. 1, '38	June 1, '39
I. Site Cost:						
Direct:						
Land Cost	(215,781.00	3,818,640.00	1,128,384.00)	1,644,782.34	1,959,060.32	2,006,024.66
Other Acquisition Costs		No Details Available		74,877.20	15,056.94	67,919.18
Total Direct Costs	215,781.00	3,818,640.00	1,128,384.00	1,719,659.54	1,984,117.26	2,073,943.84
Indirect:						
Abnormal Foundations		No Details Available		248,504.00	394,217.02	.....
Tenant Relocation Expenses		No Details Available		4,223.30	1,348.60	5,525.82
Demolition and Clearing		No Details Available		36,158.59	7,956.62	117,195.52
Park Development		No Details Available		.....	.....	.....
Total Indirect Costs	.....	.....	.....	288,885.89	403,522.33	122,721.34
Total Site Cost	**215,781.00**	**3,818,640.00**	**1,128,384.00**	**2,008,545.43**	**2,387,639.59**	**2,196,665.18**
II. Site Improvement Cost:						
Top Soil and Planting	.....	51,083.00	30,880.00	78,529.03	84,293.57	57,047.02
Street and Yard Improvements		No Details Available		181,253.88	176,229.78	86,479.92
Other		No Details Available		14,112.04	59,579.40	11,076.74
Total Site Improvement	.....	**51,083.00**	**30,880.00**	**273,894.95**	**320,102.75**	**154,603.68**
III. Construction Cost:						
Direct:						
Foundations	1,168,862.00	297,902.00	251,387.00	438,124.89	496,085.35	410,186.32
Superstructure		8,268,265.00	2,552,814.00	7,945,334.27	8,687,922.10	4,161,516.17
Equipment		199,003.00	72,340.00	249,875.74	303,790.96	161,056.65
Total Direct Costs	1,168,862.00	8,765,170.00	2,876,541.00	8,633,334.90	9,487,798.41	4,732,759.14
Indirect:	No Details					
Design and Inspection	Available	190,035.00	105,497.00	431,114.35	489,685.33	227,421.36
Total Construction Costs	**1,168,862.00**	**8,955,205.00**	**2,982,038.00**	**9,064,449.25**	**9,977,483.74**	**4,960,180.50**
IV. All Other Costs, Incl. Contingencies	.....	**239,064.00**	**86,480.00**	**585,165.25**	**534,596.83**	**301,103.86**
Total Development Cost (Excluding Capital Donations)	**1,384,643.00**	**13,063,992.00**	**4,227,782.00**	**11,931,994.88**	**13,219,822.91**	**7,612,553.22**
Cost Per Full Room	3,722.20	2,296.65	2,165.89	1,272.43	1,160.96	1,382.60
Cost Per Dwelling Unit	11,257.29	8,054.21	7,327.17	4,688.44	4,198.09	4,969.02
Dwelling Units	123	1,622	577	2,545	3,149	1,531
Construction Rooms	372	5,688	1,952	9,378	11,387	5,500
Rental Rooms	379	5,753	1,972	10,649	12,940	6,265½
Population	258	4,664	1,644	7,920	8,484	4,089
Number of Residential Buildings and Height in Stories	3-4 Stories 5-5 Stories	20-4 Stories 4-5 Stories	7-4 Stories	25-6 Stories	26-6 Stories	20-6 Stories
Net Acreage, Excluding Parks or Playgrounds Donated by N.Y.C.H.A. to City	1.21	21.28	7.34	32.92	34.67	11.92
Area of Parks and Playgrounds Donated by N.Y.C.H.A. to City (Acres)	None	None	.21	None	14.8	1.09
Cost of Parks and Playgrounds Donated by N.Y.C.H.A. to City	None	None	$31,555	None	$715,476	$183,485
Coverage Percent	40	36	32	23	26	33
Persons Per Net Acre	213	219	224	241	245	343
Land Costs Per Sq. Ft., Excluding Streets Closed	$3.64	$4.33	$3.60	$1.44	$1.02	$4.05
Land Costs Per Sq. Ft., Including Streets Closed	$3.64	$3.64	$2.77	$1.11	$.85	$3.34
Area of Streets Closed (Sq. Ft.)	None	168,201	101,972	346,047	376,278	104,267
Area for New and Widened Streets (Sq. Ft.)	None	32,888	78,798	54,003	159,723	33,497
Average Scheduled Rent, Per Apartment Per Month, Electricity Included Except for First Houses(3)	$18.29	$29.51	$28.51	$22.64	$22.67	$24.80

(1) East River — 2-6 & 10 stories indicates 2 buildings with a 6 story unit and a 10 story unit.
(2) Fort Greene — Construction Cost includes $319,000 for Post War Community Building.

Public Housing Cost in New York City

percent, and all other costs 4 percent. Individual projects, however, show marked divergence from these overall ratios. Construction costs ranged from 60.2 percent of total cost, in the 3,501-unit Fort Greene project (built between 1941 and 1944), to 84.4 percent, in First Houses, a 123-unit development erected in 1935-6. Site costs, exclusive of improvements, vary from a low of 13.5 percent of total outlay, for the 400-unit Clason Point project, to 32.5 percent at Fort Greene.

Three of these projects, South Jamaica, East River Houses and Kingsborough, were selected by a special committee for detailed comparison of construction costs with those of private and limited-dividend developments. An abstract of the comparisons made by this committee will be found elsewhere in this issue, entitled "Housing Construction Cost Study Sets New Yardsticks."

Vladeck City	South Jamaica	East River	Kingsborough	Clason Point	Wallabout	Edwin Markham	Fort Greene	GRAND TOTAL	
Private with City Grant	Private and USHA	Private and USHA	Private and USHA	Private and USHA	FWA and USHA	Private and FPHA	STATE		
Manhattan	Queens 1939–40 July 15, '39	Manhattan 1940–41 Dec. 15, '39	Brooklyn 1940–41 May 1, '40	Bronx 1941 Mar. 15, '41	Brooklyn 1941 May 19, '41	Richmond 1942–43 Mar. 5, '41	Brooklyn 1941–44 Nov. 15, '40		Percent of Total
338,290.21	328,695.63	1,246,736.43	1,254,631.55	260,300.00	185,130.00	420,620.88	5,600,234.52	20,417,311.54	
7,682.97	13,191.22	17,824.67	47,526.82	9,274.50	11,000.00(x)	25,665.32	130,824.29	420,843.11	
345,973.18	341,886.85	1,264,561.10	1,302,158.37	269,574.50	196,130.00	446,286.20	5,731,058.81	20,838,154.65	23
.....	.....	200,340.00	.....	7,500.00	.....	20,526.30	461,863.41	1,332,950.73	
347.61	3,934.58	1,020.84	9,883.84	.....	Included above(x)	2,562.85	18,635.46	47,482.99	
1,917.19	6,445.71	29,377.25	58,609.08	700.00	5,908.00	9,744.25	241,305.73	515,317.94	
.....	.....	.....	.....	.....	.....	.....	51,308.82	51,308.82	
2,264.80	10,380.29	230,738.09	68,492.92	8,200.00	5,908.00	32,833.40	773,113.42	1,947,060.48	2
348,237.98	**352,267.14**	**1,495,299.19**	**1,370,651.29**	**277,774.50**	**202,038.00**	**479,119.60**	**6,504,172.23**	**22,785,215.13**	**25**
8,608.54	21,829.73	41,106.36	44,730.35	35,044.44	5,636.00	43,239 73	122,300.00	624,327.77	
13,441.99	37,568.97	76,807.69	63,431.70	58,163.02	11,930.00	63,069.22	232,850.00	1,001,226.17	
4,188.61	10,796.36	7,912.75	23,995.00	38,247.00	714.00	38,872.35	.....	209,494.25	
26,239.14	**70,195.06**	**125,826.80**	**132,157.05**	**131,454.46**	**18,280.00**	**145,181.30**	**355,150.00**	**1,835,048.19**	**2**
78,546.67	89,425.73	201,097.93	189,005.00	166,386.00	No Breakdown	131,990.00	684,737.26	3,434,874.15	
717,250.37	1,308,625.00	2,938,377.15	2,988,804.01	1,241,483.57	583,707.00	1,241,547.78	10,300,797.64	54,105,256.06	
23,718.03	55,023.89	111,472.24	114,780.48	44,005.66	33,632.00	46,862.56	397,237.60	1,812,798.81	
819,515.07	1,453,074.62	3,250,897.32	3,292,589.49	1,451,875.23	617,329.00	1,420,400.34	11,382,772.50	59,352,929.02	66
36,952.13	117,224.51	233,447.06	219,057.48	125,449.49	34,500.00	127,885.93	663,410.70	3,001,680.34	3
856,467.20	**1,570,299.13**	**3,484,344.38**	**3,511,646.97**	**1,577,324.72**	**651,829.00**	**1,548,286.27**	**12,046,183.20**	**62,354,609.36**	**69**
39,351.13	**88,538.67**	**199,229.63**	**160,989.82**	**70,438.55**	**3,500.00**	**46,139.49**	**1,089,494.57**	**3,444,031.80**	**4**
1,270,295.45	**2,081,300.00**	**5,304,700.00**	**5,175,445.13**	**2,056,992.23**	**875,657.00**	**2,218,726.66**	**19,995,000.00**	**90,418,904.48**	**100**
1,323.65	1,327.36	1,229.08	1,243.20	1,221.49	1,146.14	1,523.85	1,522.50	1,450.72	
5,293.33	4,645.76	4,533.93	4,438.63	5,142.48	4,230.21	6,163.13	5,711.23	5,306.27	
240	448	1,170	1,166	400	207	360	3,501	17,039	
960	1,568	4,316	4,163	1,684	764	1,456	13,133	62,321	
1,080	1,792	4,883	4,675	1,852	867½	1,551	13,526	68,194	
720	1,164	3,790	3,138	1,620	661	1,286	13,040	52,478	
4–6 Stories	6–3 Stories 5–4 Stories	5– 6 Stories 2–10 Stories 1–11 Stories 2–6 & 10 Stories(1)	16–6 Stories	46–2 Stories	1–13 Stories	30–2 Stories	27– 6 Stories 4–11 Stories 4–13 Stories (2)	259 (Bldgs.)	
1.73	9.12	10.71	15.28	17.03	1.01	12.40	38.34	214.96	
None	None	1.06	.69	None	None	None	3.0	20.83	
None	None	$134,948	$59,135	None	None	None	$518,560	$1,643,159	
38	21	24	19	21	25	26	22	25.24	
416	128	354	205	95	654	104	340	244	
$3.90	$1.11	$3.27	$2.24	$.42	$4.16	$.76	$3.65	$2.30	
$3.90	$.81	$2.67	$1.80	$.35	$4.16	$.67	$2.80	$1.86	
None	112,081	85,110	136,444	128,669	None	74,595	467,531	2,101,196	
1,900	9,974	None	None	None	614	91,215	175,666	638,279	
$31.50	$22.39	$24.60	$22.88	$26.13	$27.52	$40.37	$26.79		

(3) Average scheduled rents for all projects except Edwin Markham and Wallabout Houses are basic rents. War duration families whose incomes exceed 5 or 6 times these rents are required to pay surcharges in addition to basic rent. Rents for Edwin Markham are temporary for War Workers. Rents for Wallabout have been set in accordance with the National rent schedule for enlisted personnel.

Cost Study of One-Story Factory

Five schemes were considered to determine the most acceptable and economical design of a one-story factory building. When the study revealed no conclusive economic advantages of one scheme over the others, weight was given in choosing the final design to appearance, maintenance, suitability for expansion, availability of material and convenience of layout.

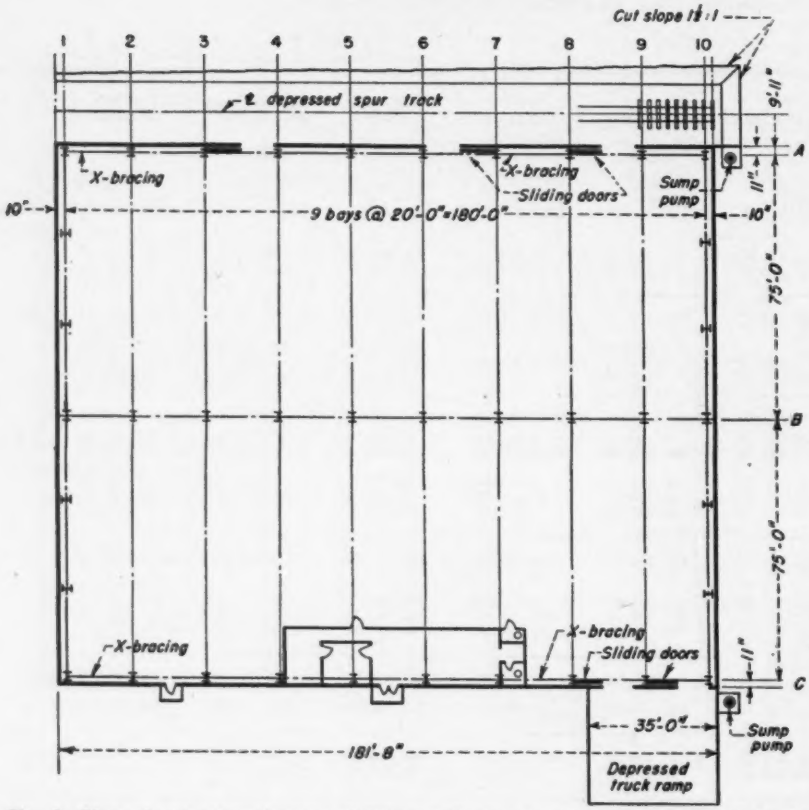
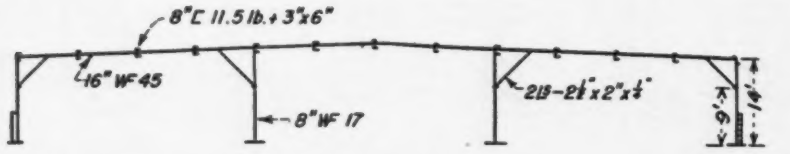


Fig. 1. Plan of one-story factory building indicates location of depressed track and truck ramp.



SCHEME I—THREE 40-FT. BAYS

Quantities — 20-ft. Bay		Cost Estimate — 20-ft. Bay	
2-in. sheathing	4,800 b. m.	5 ft. of 6-in. conc. wall — 5 × 20 × 1.00	= $100
3 × 6 nailers	390	Steel sash — 6.75 × 20 × 1.00	= 135
	5,190 b. m.	Corr. asb.-cem. siding — 2.5 × 20 × 0.40	= 20
			$255
Roof girders	5,400 lb		
Roof purlins	2,300	2 walls — 2 × 255	= $510
Columns	1,000	5.19 m. b. m. @ 120	= 622
Angle braces	210	4.46 tons @ 240	= 1,070
	8,910 lb.		$2,202 or $0.92 per sq. ft.

LOW UNIT COST was achieved for a one-story frame factory building recently erected in Los Angeles County, Calif., as a result of attention given to economy in preliminary studies. Boyd, Lind, Knox & Philpot, consulting engineers and architects of Los Angeles, considered five schemes.

Cost comparisons were made but no considerable economic differences were disclosed. Finally, a decision was made on the basis of certain desirable features of one of the designs, and a low bid of about $2.09 per sq. ft. resulted. The following is based on a design report by the engineers.

Low initial cost contemplated

Westbuilt Metal Products Co. wanted constructed at low initial cost and as quickly as possible a one-story building having a floor area of about 25,000 sq. ft., to be used for the manufacture of light-gage steel products, such as utility cabinets. The site, presenting no special foundation conditions, was located in Maywood, and the structure had to conform to the requirements of the Los Angeles County building laws. Convenient means of railroad car and truck loading and unloading had to be provided.

To eliminate one large cost item, it was decided to depress the spur track and the truck ramp, thus eliminating not only the fill that would be required to raise the floor to car level, but also a 3-ft. 6-in. retaining wall around three sides of the building. This plan required that an automatic sump pump be provided in each depression for drainage.

Several schemes studied

Two types of construction, as specified in the Los Angeles County building code, were considered in preliminary studies: Type IV—light incombus-

tible frames and Type V—wood frames. Although wood-frame walls could be used for Type V construction, it was decided that masonry or concrete walls would be more desirable, even at extra cost.

Preliminary design studies were made in five different arrangements. These investigations considered only comparable items for a 20-ft. bay unit. No floor slab, footings, or similar items common to all schemes were considered. The results were as shown in Table 1, p. 104.

Considerations affecting choice

A comparison of these costs shows no conclusive economic advantage for any of the schemes. It was, therefore, necessary to choose the one that would be the most satisfactory for other considerations. Scheme IV was chosen for the following reasons:

1. Owner may expand at a later date and wall construction for this type building is practically 100 per cent salvageable.

2. The light steel members used were available locally, whereas lumber was critically short.

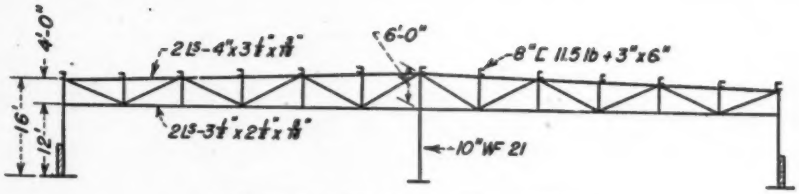
3. Appearance and maintenance considerations favored steel over timber.

4. Two 75-ft. aisles gave a better plant layout than two 60-ft. or three 40-ft. aisles.

At the time these comparisons were made, it was believed that a sprinkler system would be necessary for either Type IV or Type V construction, as the final floor area of 27,000 sq. ft. was greater than the basic allowed for either of these types under the Los Angeles County code. Later, when the property description was obtained, it was found that by locating the building close to one property line and taking advantage of the percentage increase allowed for clearance on three sides, the sprinkler system could be eliminated. This would not be possible for a Type V building. Hence, the structure chosen had an additional $0.20 per sq. ft. advantage over the timber designs considered.

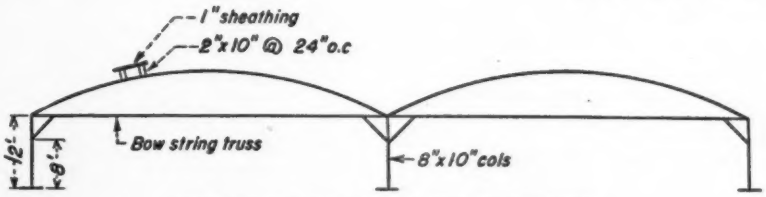
Steel structure selected

The final design calls for a 150-ft. by 180-ft. structure, with steel frame and sash; corrugated asbestos-cement siding; concrete foundations, walls and floor; and composition roofing on 2-in. plank sheathing. Provision is made on two sides for future expansion.



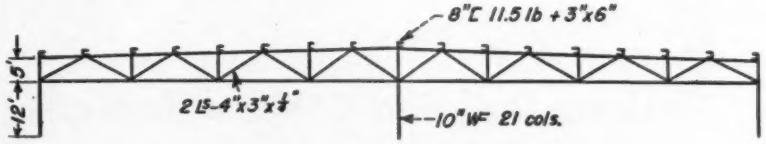
SCHEME II—TWO 60-FT. STEEL TRUSSES

Quantities — 20-ft. Bay		Cost Estimate — 20-ft. Bay	
2-in. sheathing	4,800 b. m.	5 ft. of 6-in. conc. wall — 5 × 20 × 1.00	= $100
3 × 6 nailers	390	Steel sash — 6.75 × 20 × 1.00	= 135
	5,190 b. m.	Corr. asb.-cem. siding — 4.5 × 20 × 0.40	= 36
			$271
Trusses	5,510 lb.	2 walls — 2 × 271 =	$542
Purlins	2,300	5.19 m. b. m. @ 120 =	622
Columns	1,050	4.43 tons @ 240 =	1,065
	8,860 lb.		$2,229 or $0.93 per sq. ft.



SCHEME III—TWO 60-FT. TIMBER TRUSSES

Quantities — 20-ft. Bay		Cost Estimate — 20-ft. Bay	
1-in. sheathing	2,400 b. m.	8-in. conc. wall — 172 × 1.25	= $215
2 × 10 purlins	4,000	Steel sash — 172 × 1.00	= 172
			$387
2 × 10 blocking	400		
3 — 8½ × 10 columns	240		
	7,040 b. m.	2 walls — 2 × 387 =	$774
		7.04 m. b. m. @ 130 =	918
		Trusses — 2 × 275 × 1.12 =	618
2 Bowstring trusses (price from mfrs. and add 12 percent for contractor's overhead and profit.)			$2,310 or $0.96 per sq. ft.



SCHEME IV—TWO 75-FT. STEEL TRUSSES

Quantities — 20-ft. Bay		Cost Estimate — 20-ft. Bay	
2-in. sheathing	6,000 b. m.	5 ft. of 6-in. conc. wall — 5 × 20 × 1.00	= $100
3 × 6 nailers	510	Sash — 6.75 × 20 × 1.00	= 135
	6,510 b. m.	Siding — 5.5 × 20 × 0.40	= 44
			$279
Trusses	7,500 lb.		
Purlins	3,920	2 walls — 2 × 279 =	$558
Struts	465	6.51 m. b. m. @ 120 =	782
Columns	1,110	6.5 tons @ 240 =	1,560
	12,995 lb.		$2,900 or $0.97 per sq. ft.

SCHEME V—TWO 75-FT. TIMBER TRUSSES
(Similar to Scheme III)

Quantities — 20-ft. Bay		Cost Estimate — 20-ft. Bay	
1-in. sheathing	3,000 b. m.	8-in. conc. wall — 172 × 1.25	= $215
2 × 10 purlins	5,000	Sash — 172 × 1.00	= 172
			$387
2 × 10 blocking	500		
3 — 8 × 10 columns	240		
	8,740 b. m.	2 walls — 2 × 387 =	$774
		8.74 m. b. m. @ 130 =	1,140
		Trusses — 2 × 440 × 1.12 =	988
2 Bowstring trusses (price from mfr. and add 12 percent for contractor's overhead and profit.)			$2,902 or $0.97 per sq. ft.

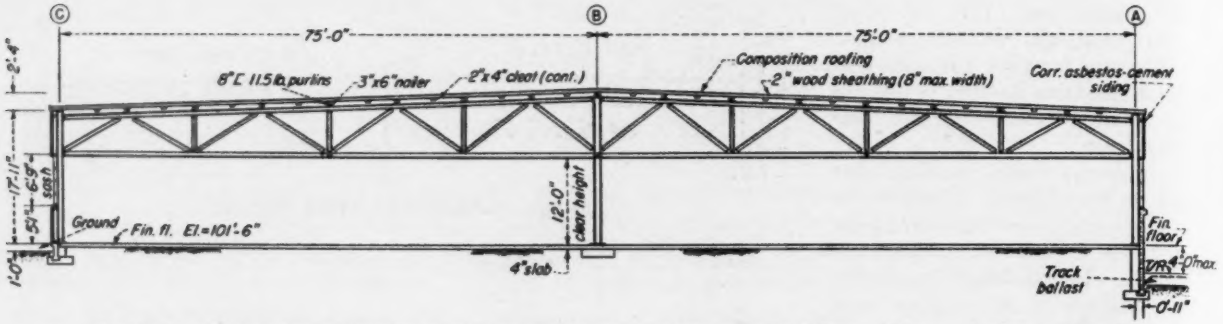


Fig. 2. The final design called for steel frame and sash, asbestos-cement siding, and concrete floor and walls.

In the final design every effort was made to keep the details as simple and "clean" as possible, and Class A materials were specified throughout. The estimate in Table II was based on "in place" unit costs and included contractor's overhead and profit. Consequently, total cost to owner was estimated at $66,000.

Allowing more time reduced bid

Seven bids received from selected contractors for completing the job in 100-days ranged from $57,230 to $69,800, with an average of $65,300. After the contract was awarded last October, the low bidder, William O. Gray of Lynwood, Calif., offered an alternate bid of $800 less if an additional 14 days completion time were allowed. This was accepted by the owner. The revised bid, including subgrade preparation but not track, was $56,430, or about $2.09 per sq. ft.

TABLE I—SUMMARY OF PRELIMINARY COST STUDIES FOR 20-FT. BAY

Scheme	Description	Est. comparative cost for 20-ft. bay	Est. comparative cost per sq. ft.
I	Type IV — Three 40-ft. aisles; steel beams, columns, purlins	$2,202	$0.92
II	Type IV — Two 60-ft. aisles; steel columns, trusses, purlins	2,229	0.93
III	Type V — Two 60-ft. aisles; timber trusses, columns, rafters	2,310	0.96
IV	Type IV — Two 75-ft. aisles; steel trusses, columns, purlins	2,900	0.97
V	Type V — Two 75-ft. aisles; timber trusses, columns, rafters	2,902	0.97

TABLE II—ENGINEER'S ESTIMATE FOR ONE-STORY FACTORY

Item	Quantities	Total cost
Structural steel	81 tons @ $240	$19,440
Concrete		18,028
Floor slab	336 yd. @ $23 — $7,728	
Foundation and walls	206 yd. @ $50 — 10,300	
Lumber	67 m.b.m. @ $120	8,040
Steel sash and glass	4,050 sq. ft. @ $1.10	4,455
Corrugated asbestos cement siding	6,000 sq. ft. @ $0.40	2,400
Office and toilet room	Lump sum	3,500
Lighting	Lump sum	3,000
Utilities	Lump sum	2,400
Roofing	27,800 sq. ft. @ $0.12	3,340
Clearing, grading and earthwork	Lump sum	1,400
Total		$66,003

Uniform Building Codes Adopted To Cut Construction Cost

Reflecting the mounting interest of state governments in lowering building costs and encouraging use of new materials, New Mexico and Indiana have recently adopted modern building codes. Also, Colorado, Connecticut, New Jersey, Iowa and Missouri are actively promoting uniform building laws, reports the National Association of Housing Officials.

Salient feature of the New Mexico code is flexibility, based on performance rather than specification standards. Light steel, glued wood and other new materials precluded in many states and cities by rigid specifications may be used if they meet performance requirements.

The new code applies to all new buildings and additions except some private residences; minimum requirements governing occupancy and construction are set forth. More stringent regulations may be imposed by cities and counties as long as they do not conflict with the state code, administered by a contractors' license board. Basis of the New Mexico code is the Pacific Coast Uniform Building Code, a model code revised periodically to conform with building developments.

Indiana's code is also founded on performance rather than specification standards. Revisions to keep the code up with new structural developments may be effected without recourse to involved legislative action. In both Indiana and New Mexico, the new codes have statutory force.

Colorado's new code was devised as a model available for adoption by counties, cities and unincorporated areas within the state. It was prepared by the Tri-County Regional Planning Commission in Denver and has been adopted thus far by Westwood, Westminster, and Cherry Hills Village. County commissioners have received preliminary petitions for code adoption from six other municipalities.

New Jersey's new building code applies to one and two family houses only and may be adopted or not by any municipality, as it sees fit.

The Connecticut code, designed by the state housing authority, also will be left to voluntary adoptions and local enforcement.

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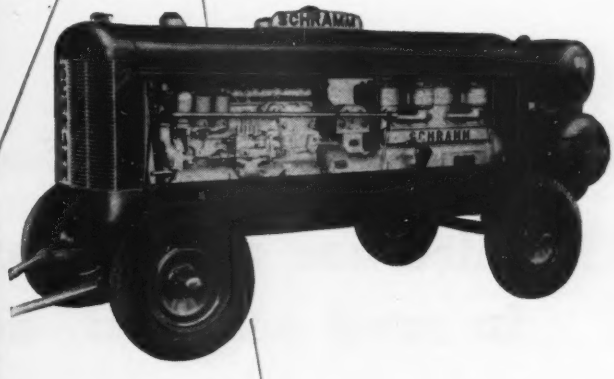

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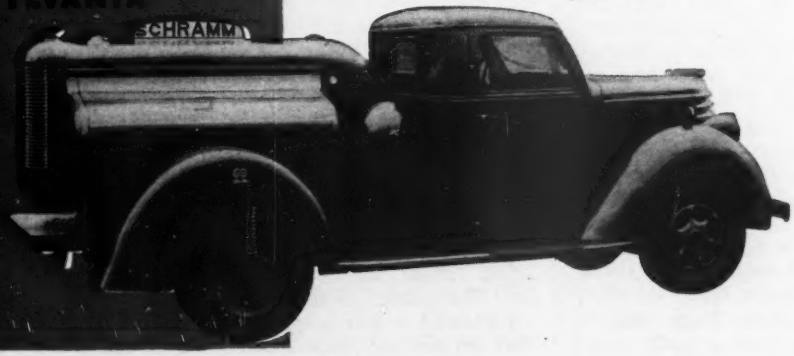

This tire has a flat footprint—rolls easily in mud and dirt, doesn't side-slip

CONTRACTORS who use towed vehicles having free-rolling wheels . . . such as scrapers, trailers, dirt wagons, etc. . . . have hard going in soft earth or mud. Side slippage is a headache. Hard pulling increases power and fuel usage. And when tires under ton-loads hit damaging obstructions, bruise breaks often lead to expensive repairs. Job costs mount; profits decline.

A few years ago B.F. Goodrich engineers dug into the problems. They analyzed the peculiar tire requirements for towed vehicles. Then they designed a special tire with large contact area for maximum flotation, a tire that rolls freely, resists side-slip.

This tire, called the "Earth Mover," is shown above. Note how the large tread surface touches the ground—the special shoulder contour adding to the large contact area. This gives the Earth Mover a large, flat "footprint" that helps it float over soft mud and dirt. It also gives long, even wear when used on well-maintained haulage roads.

Note, too, the continuous running ribs with no "humps" in the tread design. This gives unusually easy rolling—means that *less* power is used in tough going. The heavy curb strips along the sidewall protect against scuffing. The sharp edges across the tread surface width give positive protection against side slippage.

The "inside" advantages are great, too. The tread rubber is especially compounded to give long, even wear. The special cord body construction, with *four to six breakers*, gives extra bruise resistance and protection against breaks.

Users of the Earth Mover—and of other B.F. Goodrich Tires *designed* to meet special needs—report longer tire wear. Time savings are great. Repair bills are lower. Delays are reduced. It's a safe bet that you, too, can make savings with the B.F. Goodrich tires that suit *your* needs. See the B.F. Goodrich dealer, or write us direct. *The B.F. Goodrich Company, Akron, O.*

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B.F. Goodrich

HIGHLIGHTS OF...

Construction Costs - 1946

Construction costs took center stage and spotlight in the closing months of 1945 and the first quarter of 1946. Bids were called in heavy volume, and a higher than normal number rejected because they exceeded engineer's estimates and wage and material price increases. On the other hand, enough satisfactory bids were received to push construction volume up to $61,000,000 a week average in the last quarter of 1945 and to $75,000,000 a week in the first quarter of 1946 compared with $29,000,000 in the first quarter of 1945, which was the war low.

Uncertainties on material and labor supply, actual known shortages of both, spotty conditions on labor efficiencies, low productivity in some areas or on some jobs, provided the "invisible" costs that pushed many bids up higher than would be indicated by the cost indexes that measure materials price and labor wage trends.

The *Engineering News-Record* Construction Cost index gained only 11 points between January and December 1945, but shot up 21 more points by April, 1946.

Common labor wages increased 5 percent in 1945 in the 20-cities covered by *Engineering News-Record*, but by April, 1946 were up 12 percent over January, 1945.

The *Engineering News-Record* Building Cost Index gained 10 points during 1945, and another 13 by April, 1946.

The skilled labor wage average for 20-cities increased 2½ percent during 1945, but by April, 1946 was up a little more than 7 percent over January, 1945.

Steel's 25c. per cwt. price rise in April, 1946 represents it's first price change since 1938 when a drop was recorded.

Lumber prices increased about half a percent in 1945 as measured by the *ENR* 20-cities average, but by April, 1946 had registered almost a 4 percent increase over January, 1945, a 3 percent rise for the first 4 months of 1946.

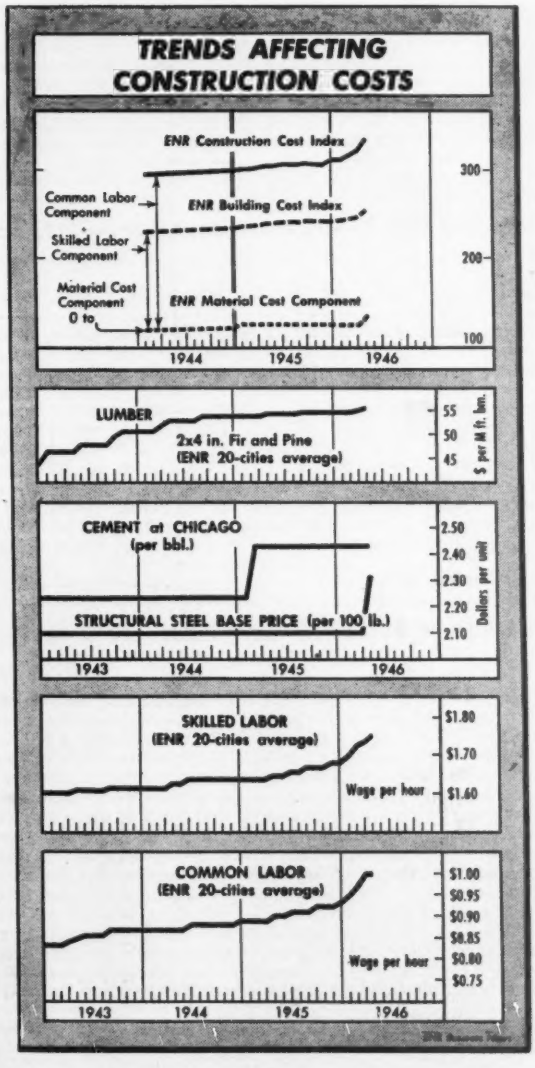
Construction wages continued to lose ground in their relative standing with manufacturing wages. In 1939, before the heavy war work started, construction skilled wages were 78 percent higher than manufacturing skilled and semi-skilled as measured by the National Industrial Conference Board. In 1945 construction skilled wages were only 33 percent above manufacturing skilled and semi-skilled. Common construction labor in 1939 enjoyed a 15 percent higher wage than manufacturing unskilled workers, but in 1945 construction common labor's wages were running 1 percent below manufacturing unskilled.

Construction men report labor shortages and low productivity on some current construction jobs because of these shortages. The deteriorated relative position of hourly earnings of construction compared with manufacturing labor undoubtedly contributes to these construction labor shortages.

Construction labor productivity has been such a vital question in this period of rising prices and wages, that *Engineering News-Record*, with the aid of some of the country's leading contractors who were active both in 1939 and now, measured actual experience with construction labor productivity in the first quarter of 1946 compared with 1939. The results of this study are reported in this issue on pages 67 and 99, but while reports range from 30 to 100 percent of 1939 efficiencies, the median construction labor productivity reported in the opening quarter of 1946 is about 65 percent of 1939 productivity.

Reasons given by contractors for these low efficiencies on current work include "labor shortage" by 66 percent of the contractors reporting, "lack of interest" by 56 percent, "workers new to construction", 34 percent, "feather bedding rules", 31 percent, "union work quotas", 25 percent, "workers new to contractor's organization", 19 percent, "average age of trade men abnormally high", 16 percent, "shortage of materials", 9 percent, "holdover from overmanning of war work", 6 percent, "absenteeism", 6 percent, "jurisdictional troubles", 3 percent, "doing work with higher scale crafts—as carpenters wrecking forms", 3%.

Construction is moving ahead in rising volume despite its "reconversion" troubles. But construction costs and all the factors that influence them will continue to occupy center stage.



ENR Construction and Building Cost Indexes

THE ENGINEERING NEWS-RECORD Construction Cost Index has four components: (1) structural steel shapes, base price x 25 cwt.; (2) cement at Chicago x 6 bbl.; (3) lumber, which until 1935 was 12 x 12 long leaf yellow pine wholesale at New York, and since 1935 is 2 x 4 S4S pine and fir in carload lots, *ENR* 20-cities average x 1.088 M.ft.B.M.; (4) common labor, *ENR* 20-cities average of wage rates in force x 200 hrs.

THE ENGINEERING NEWS-RECORD Building Cost Index differs from the Construction Cost Index only in that the trend of skilled labor is used, ENR 20-Cities skilled average x 68.38 hrs. The three material components are the same for both indexes.

For data on converting from 1913 = 100 to other bases see page 111.

Reprints of the colored insert charts on Construction and Building Cost Indexes are available from the *Engineering News-Record* editorial offices, 330 West 42nd Street, New York 18, N. Y., as flat unfolded wall charts, 2 for $1.00. Lower rates on quantities.

Engineering News-Record CONSTRUCTION Cost Index—1913 = 100, 1903–1929

Yearly Aver. 1903–'14			1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	
		J	89.22	87.12	112.66	167.75	184.51	198.05	206.55	237.08	168.72	191.70	217.90	210.40	207.15	211.50	203.90	209.40	J
1903.....	93.90	F	89.22	87.36	116.66	167.75	184.51	201.50	225.10	230.67	168.72	197.40	220.30	209.70	206.55	210.15	204.65	210.40	F
1904.....	87.40	M	88.97	87.66	125.16	175.66	184.51	198.05	240.85	224.27	162.04	205.25	224.70	210.20	207.65	208.80	204.65	207.78	M
1905.....	90.55	A	87.97	90.16	129.51	183.41	186.01	191.25	265.20	213.07	164.72	213.50	221.60	209.55	207.50	209.00	206.40	203.40	A
1906.....	95.10	M	88.62	90.16	131.06	187.61	186.01	191.25	268.90	210.82	164.62	216.70	222.38	207.20	207.30	206.80	207.00	205.15	M
1907.....	100.55	J	87.87	88.96	128.71	199.26	186.31	191.85	273.80	209.82	166.62	220.70	216.85	204.60	204.80	205.55	206.15	205.65	J
1908.....	97.20	J	88.12	90.51	127.96	204.01	188.65	193.65	265.65	203.82	169.70	222.10	214.40	204.60	207.80	203.68	206.65	204.77	J
1909.....	90.92	A	90.11	91.76	128.76	198.41	193.85	196.65	252.00	193.47	173.40	221.50	213.15	204.60	208.30	205.50	207.29	205.91	A
1910.....	96.33	S	90.36	93.01	131.76	190.31	193.85	202.85	255.20	188.27	185.00	221.50	211.25	202.10	208.30	203.60	207.29	207.57	S
1911.....	93.43	O	88.51	96.16	135.11	167.11	193.85	202.25	255.20	182.57	188.60	220.30	207.55	205.35	209.80	204.40	207.71	206.32	O
1912.....	90.70	N	87.26	101.06	138.16	166.51	193.55	206.85	255.32	166.32	188.60	220.90	205.70	205.95	210.80	201.98	209.46	208.46	N
1913.....	100.00	D	86.51	107.06	149.41	167.11	194.75	206.85	251.62	167.82	192.60	217.30	208.58	205.95	210.80	203.90	210.16	209.46	D
		Aver.	88.56	92.58	129.58	181.24	189.20	198.42	251.28	201.81	174.45	214.07	215.36	206.68	208.03	206.24	206.78	207.02	Aver.

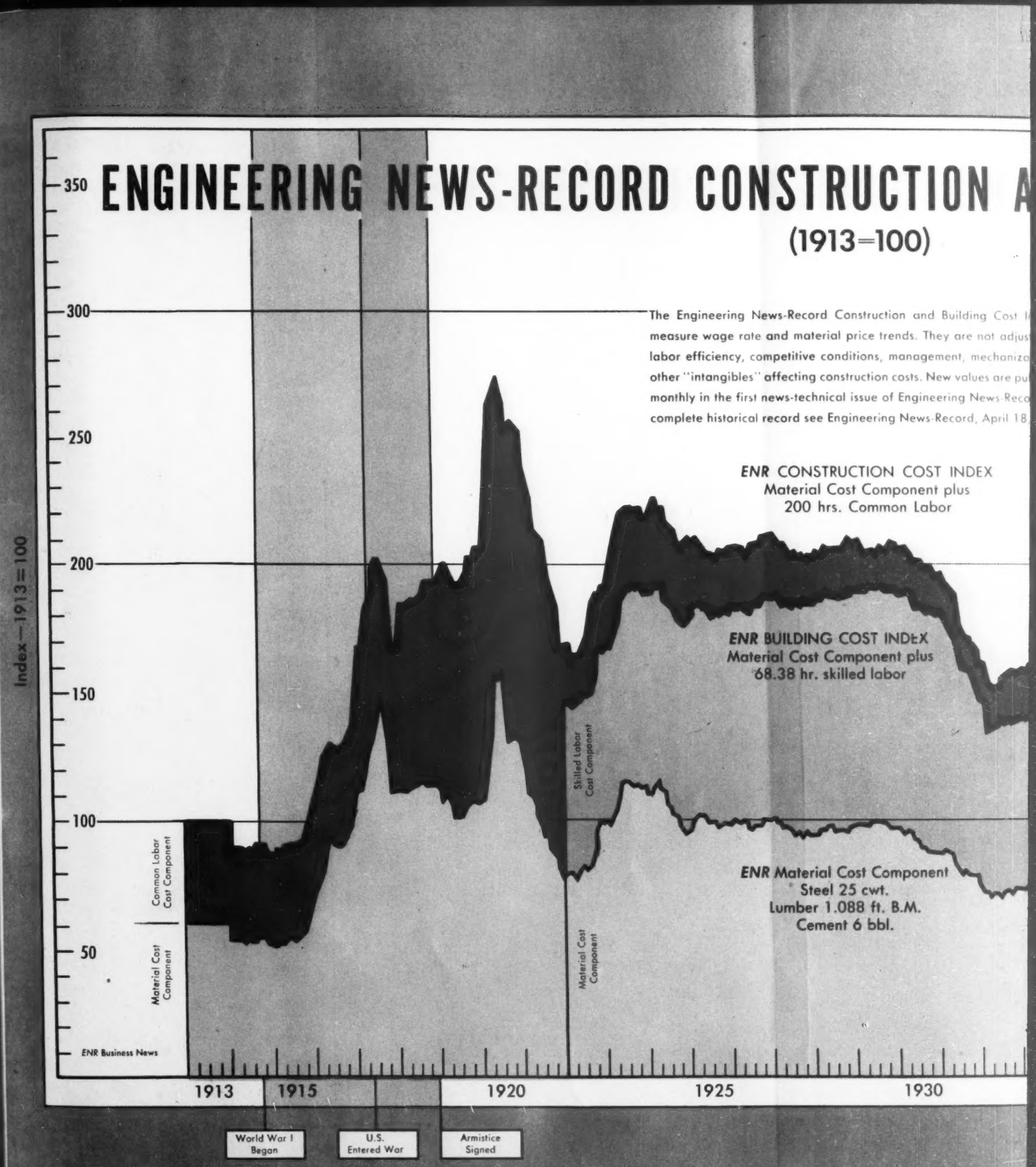
Engineering News-Record CONSTRUCTION Cost Index—1913 = 100, 1930–1946

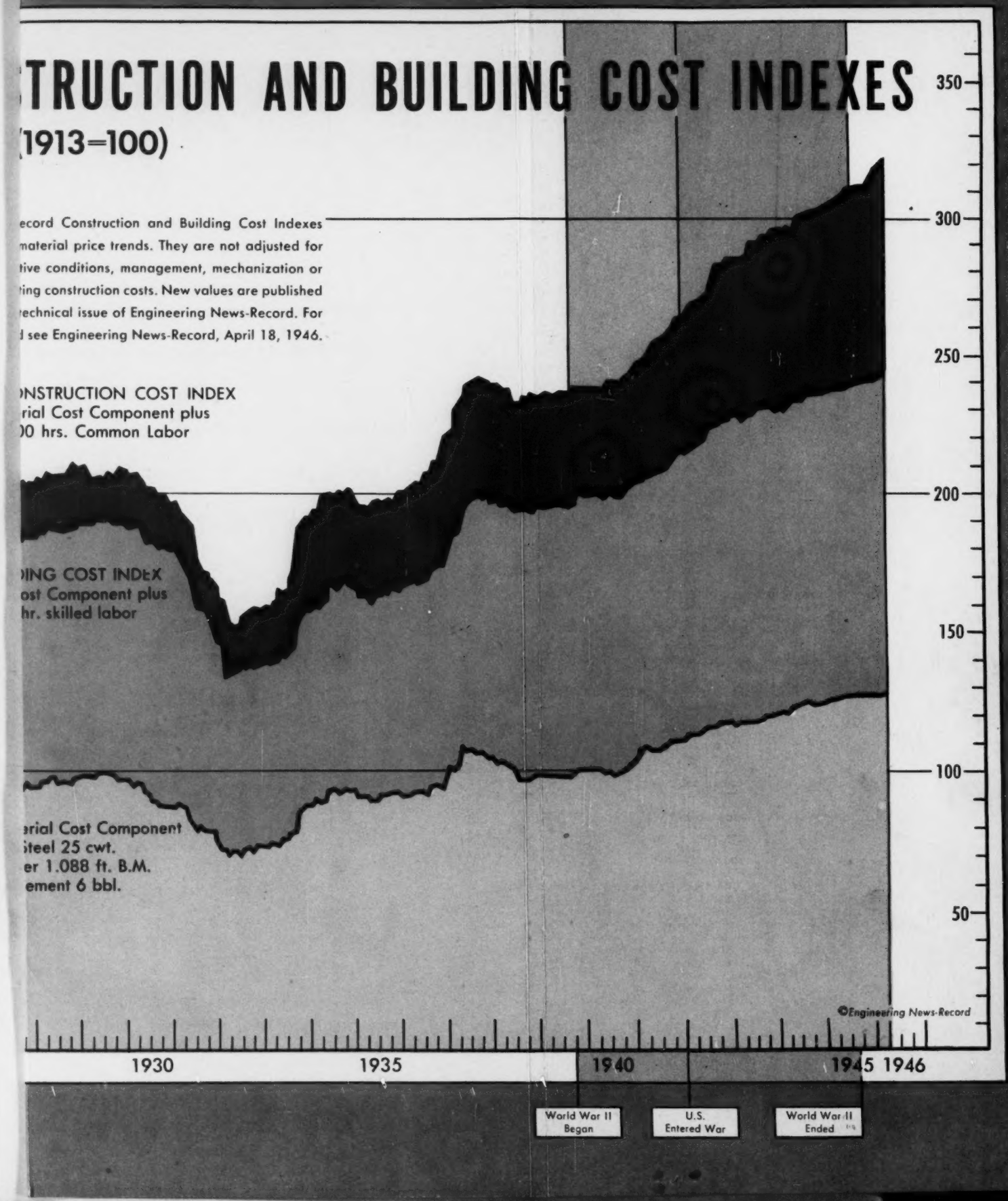
	1930	1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	1944†	1945†	1946†	
J	208.96	194.48	162.48	158.44	191.26	198.22	201.23	221.20	239.62	234.72	238.34	249.69	267.63	283.45	294.57	302.50	316.32	J
F	206.46	196.61	161.82	159.30	194.06	195.07	201.33	222.05	238.99	234.31	238.32	250.50	269.41	283.48	295.05	303.70	319.52	F
M	206.80	194.51	157.24	158.44	194.06	194.41	201.63	224.75	238.79	234.43	238.29	250.71	269.71	285.24	295.34	304.50	323.83	M
A	207.12	191.63	153.12	160.16	195.86	194.65	202.80	231.35	237.95	234.86	238.26	252.40	271.78	288.80	297.70	306.43	334.59	A
M	205.86	189.33	152.78	164.39	199.61	193.96	204.05	233.45	236.80	234.69	238.86	255.55	272.30	289.87	298.00	307.43	.....	M
J	203.36	187.23	152.20	163.41	199.61	196.73	205.08	237.25	236.86	235.02	241.59	256.79	274.19	289.94	298.72	308.99	.....	J
J	200.95	174.37	153.36	165.50	199.65	197.43	204.80	239.90	232.29	234.94	242.15	258.18	277.65	289.92	299.94	308.99	.....	J
A	200.95	171.38	156.80	167.00	198.40	197.45	208.48	240.65	232.39	234.90	242.18	260.41	281.61	291.38	300.42	309.08	.....	A
S	199.58	171.40	157.96	175.48	200.58	197.30	208.88	241.62	232.70	234.97	244.13	263.12	281.61	294.09	300.46	309.28	.....	S
O	198.72	169.78	159.16	187.74	200.86	197.50	211.53	241.90	234.30	236.86	245.02	264.46	282.44	294.31	301.06	309.28	.....	O
N	198.54	169.28	158.20	190.14	201.36	197.35	211.50	241.40	234.40	238.20	247.24	266.13	283.64	294.41	301.09	309.28	.....	N
D	196.86	166.23	158.46	192.41	201.86	197.20	215.70	241.05	234.89	238.17	249.12	266.16	283.69	294.51	302.30	313.48	.....	D
Aver.	202.85	181.35	156.97	170.18	198.10	196.44	206.42	234.71	235.86	235.51	241.96	257.84	276.31	289.95	298.64	307.74	.....	Aver.

Engineering News-Record BUILDING Cost Index—1913 = 100, 1910–1946

Yearly Aver. 1910–'23			1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	1944†	1945†	1946†	
1910....	96.4	J	189.3	182.7	184.3	187.8	185.9	190.0	190.3	180.7	150.6	140.8	160.2	166.5	168.3	185.5	198.6	196.2	201.5	207.9	217.1	226.9	231.6	236.5	242.2	J
1911....	94.1	F	191.7	184.5	183.7	189.2	187.2	190.0	188.4	182.0	147.2	141.7	161.3	165.8	168.4	186.6	199.0	196.2	201.5	208.4	218.4	226.9	232.0	237.7	243.9	F
1912....	91.4	M	194.1	184.5	184.3	187.3	187.2	190.0	189.2	180.2	145.9	140.8	161.7	164.1	169.7	187.7	199.3	196.5	201.5	207.9	218.9	226.7	232 3	237.9	245.4	M
1913....	100.0	A	191.8	184.7	184.1	186.0	188.8	190.0	188.8	177.6	135.7	141.5	163.2	164.4	170.0	195.0	198.2	196.5	201.4	208.6	219.6	227.5	234.5	238.5	254.4	A
1914....	91.9	M	192.5	182.8	183.6	185.4	190.1	191.3	187.9	174.6	136.4	143.9	168.2	163.3	170.3	197.2	197.9	196.6	201.2	209.2	220.1	227.6	234.8	238.5	.....	M
1915....	95.3	J	187.7	183.0	181.8	185.8	187.6	192.0	185.4	172.5	137.6	143.2	168.2	164.9	170.2	199.2	198.2	196.4	201.7	209.4	221.2	227.7	235.3	239.4	.....	J
1916....	130.9	J	184.5	180.2	184.3	183.9	187.6	192.0	183.3	170.5	139.5	144.3	169.2	165.3	170.9	199.8	194.4	196.8	201.7	210.2	223.5	227.9	235.6	239.6	.....	J
1917....	166.8	A	183.3	183.0	185.1	186.5	187.6	192.8	183.7	163.1	139.4	145.9	168.4	166.2	173.9	200.7	194.5	196.5	201.7	212.5	225.4	228.5	236.1	239.9	.....	A
1918....	159.1	S	181.4	180.5	185.1	184.6	187.6	191.6	182.4	159.5	139.6	154.5	170.1	166.1	174.3	200.6	194.8	196.6	203.1	214.6	225.5	231.2	236.0	240.1	.....	S
1919....	158.8	O	178.4	181.8	188.0	186.6	187.6	190.3	181.8	159.5	140.0	157.1	170.2	167.3	175.3	201.0	195.5	198.5	204.0	215.9	225.9	231.3	236.0	240.4	.....	O
1920....	207.2	N	176.5	182.4	188.0	185.0	188.0	190.3	181.8	158.3	139.5	159.0	170.2	167.3	175.5	200.3	195.6	201.2	206.2	216.5	226.6	231.4	236.1	240.5	.....	N
1921....	166.1	D	178.4	183.1	188.0	185.1	190.0	190.3	181.8	155.0	140.0	160.7	170.2	167.2	179.3	200.5	196.1	201.2	208.2	216.4	226.6	231.5	236.5	240.8	.....	D
1922....	154.9																									
1923....	186.0	Aver.	185.8	182.7	185.0	186.1	188.0	190.9	185.4	169.4	140.9	147.8	166.7	165.8	172.2	196.2	196.8	197.4	202.8	211.5	222.4	228.8	234.7	239.1	.....	Aver.

† Based on 2 x 4 S4S fir and pine *ENR* 20-cities average lumber component instead of 12 x 12 yellow pine wholesale in New York used prior to 1935. For explanation see page C-5 of June 30, 1938 *ENR*.


ENGINEERING NEWS-RECORD CONSTRUCTION A
(1913=100)
The Engineering News-Record Construction and Building Cost I
measure wage rate and material price trends. They are not adjus
labor efficiency, competitive conditions, management, mechaniza
other "intangibles" affecting construction costs. New values are pu
monthly in the first news-technical issue of Engineering News-Reco
complete historical record see Engineering News-Record, April 18,
ENR CONSTRUCTION COST INDEX
Material Cost Component plus
200 hrs. Common Labor
ENR BUILDING COST INDEX
Material Cost Component plus
68.38 hr. skilled labor
ENR Material Cost Component
Steel 25 cwt.
Lumber 1.088 ft. B.M.
Cement 6 bbl.
Index—1913=100
350
300
250
200
150
100
50
Common Labor Cost Component
Material Cost Component
Skilled Labor Cost Component
Material Cost Component
ENR Business News
1913
1915
1920
1925
1930
World War I Began
U.S. Entered War
Armistice Signed


TRUCTION AND BUILDING COST INDEXES
(1913=100)
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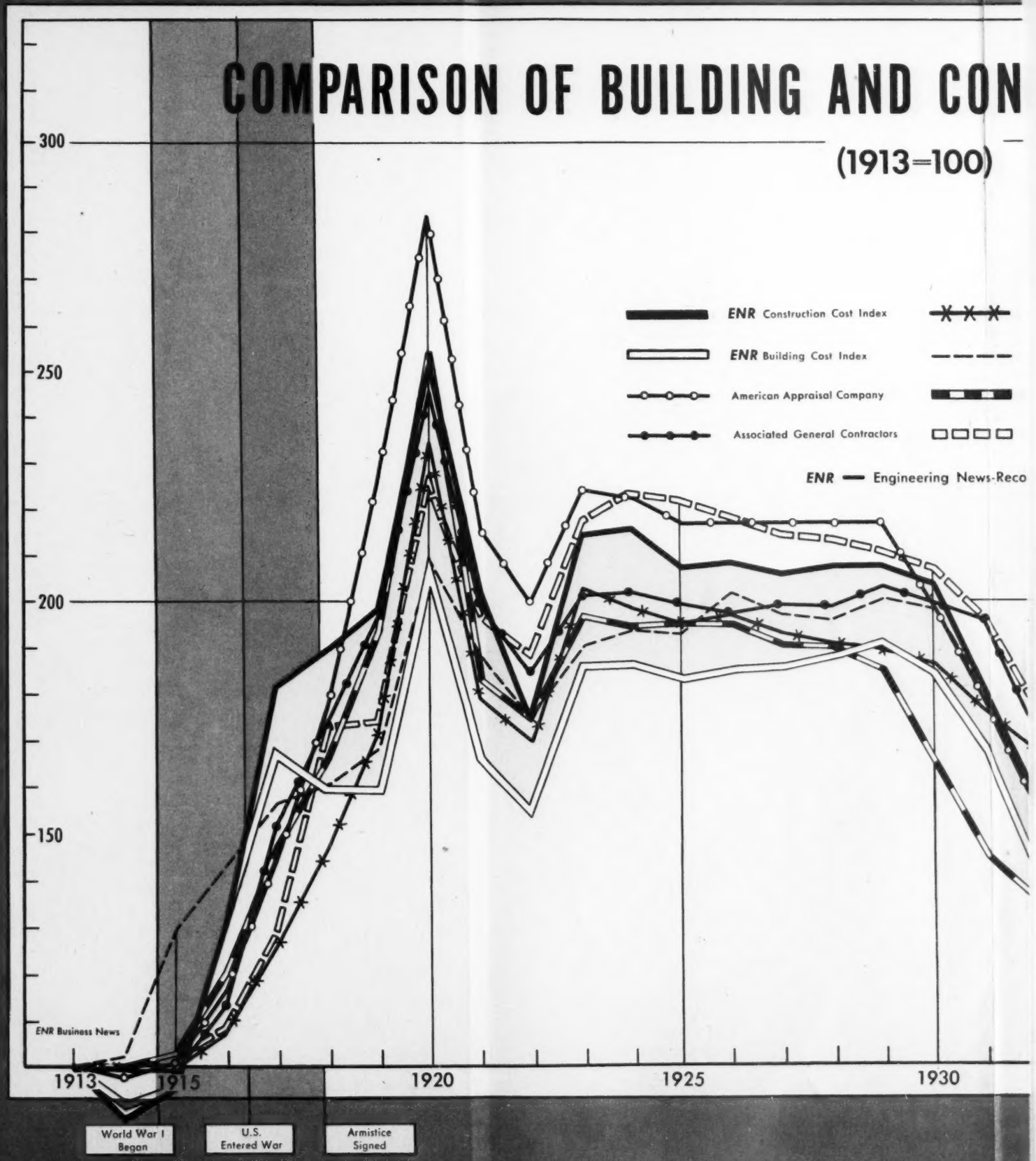
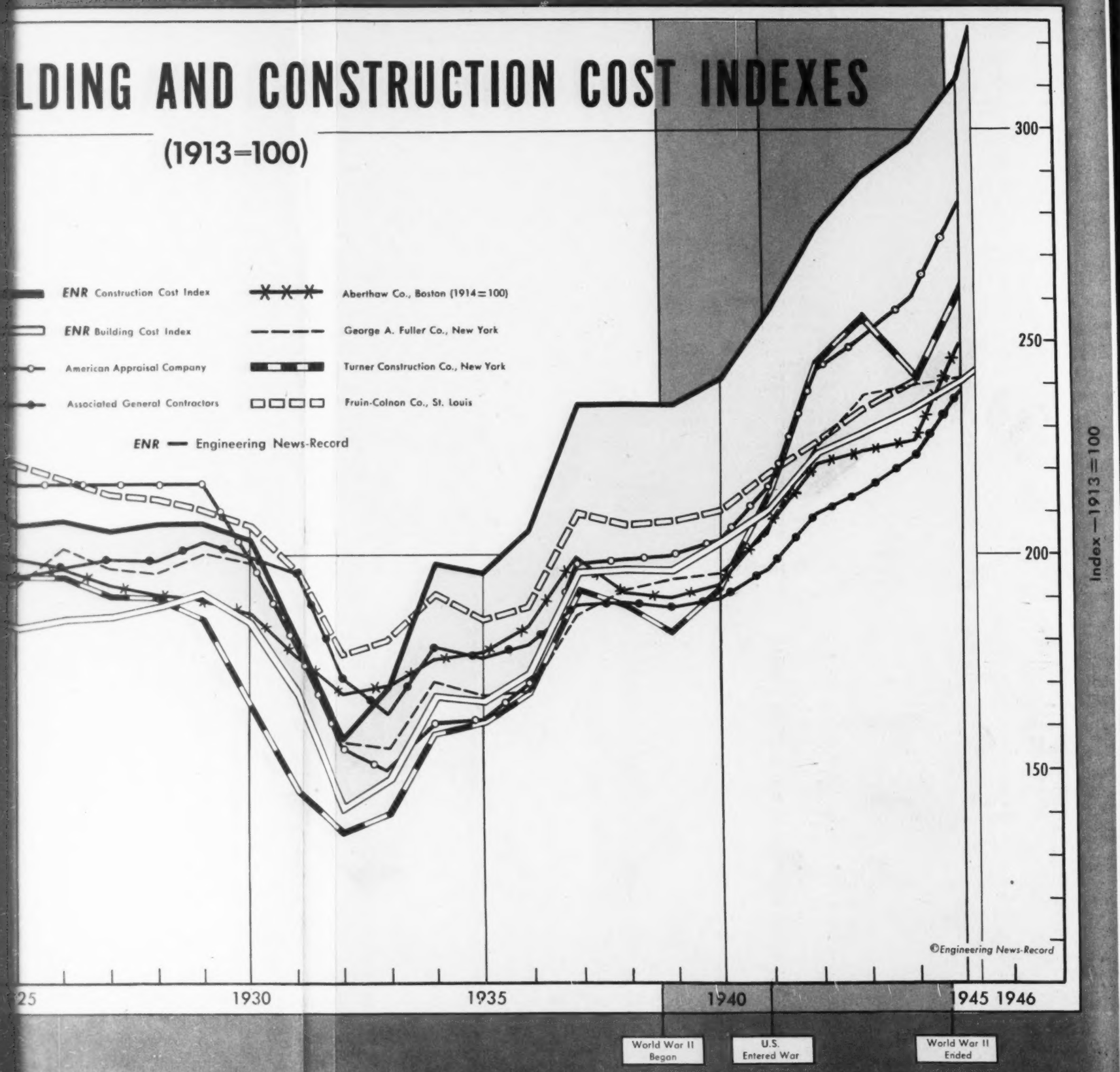
material price trends. They are not adjusted for
tive conditions, management, mechanization or
ting construction costs. New values are published
echnical issue of Engineering News-Record. For
l see Engineering News-Record, April 18, 1946.
ONSTRUCTION COST INDEX
rial Cost Component plus
00 hrs. Common Labor
DING COST INDEX
ost Component plus
hr. skilled labor
erial Cost Component
steel 25 cwt.
er 1.088 ft. B.M.
ement 6 bbl.
350
300
250
200
150
100
50
Index—1913=100
©Engineering News-Record
1930
1935
1940
1945
1946
World War II Began
U.S. Entered War
World War II Ended


COMPARISON OF BUILDING AND CON
(1913=100)
ENR Construction Cost Index
ENR Building Cost Index
American Appraisal Company
Associated General Contractors
ENR — Engineering News-Reco
Index—1913=100
300
250
200
150
1913
1915
1920
1925
1930
ENR Business News
World War I Began
U.S. Entered War
Armistice Signed


LDING AND CONSTRUCTION COST INDEXES
(1913=100)
ENR Construction Cost Index
ENR Building Cost Index
American Appraisal Company
Associated General Contractors
Aberthaw Co., Boston (1914=100)
George A. Fuller Co., New York
Turner Construction Co., New York
Fruin-Colnon Co., St. Louis
ENR — Engineering News-Record
300
250
200
150
Index — 1913=100
©Engineering News-Record
25
1930
1935
1940
1945
1946
World War II Began
U.S. Entered War
World War II Ended

Building and Construction Cost Indexes Compared

Composition and historical review of twelve construction and building cost indexes

ENGINEERING NEWS-RECORD CONSTRUCTION COST (ENR Const.) Structural steel shapes, base price x 25 cwt.; cement at Chicago x 6 bbl.; lumber 2x4 S4S pine and fir in carload lots, ENR 20-cities average x 1.088 M.ft.B.M.; common labor, ENR 20-cities average, x 200 hrs. Base: 1913 = 100. See pages 108, 111.

ENGINEERING NEWS-RECORD BUILDING COST (ENR Bldg.)—Structural steel shapes, base price x 25 cwt.; cement at Chicago x 6 bbl.; lumber 2x4 S4S pine and fir in carload lots, ENR 20-cities average x 1.088 M.ft.B.M.; skilled labor, ENR 20-cities average, x 68.38 hrs. 1913 = 100.

AMERICAN APPRAISAL COMPANY (AAC)—Average for 30 cities of four types of buildings: wood frame, brick-wood frame, brick-steel frame, reinforced concrete. Mechanicals not included. Based on actual appraisal costs. Available for individual cities (see page 113). Includes adjustments for social security taxes, unemployment insurance and corresponding "overhead". Base: 1913 = 100.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA (AGC)—Wages and materials for 12 cities combined in 40-60 ratio. Wages, prevailing rates for hod carriers and common labor. Materials, weighted: sand, gravel and crushed stone, 1; cement, 1; lumber, 1; hollow tile, ¼; structural and reinforcing steel, ¼. Base: 1913=100.

E. H. BOECKH & ASSOC., INC.—Individual series for ten types of buildings for sixteen areas. Weights based on studies of actual building costs—vary with different type of structures. Material prices are those paid by contractors to material dealers. Prevailing skilled and common wage rates from contractors. Base: United States average, 1926-29=100. Series given here is brick and concrete, New York, converted to 1913=100 base. For further definition see page 117.

HANDY PUBLIC UTILITY CONSTRUCTION COST—Compiled and published Jan. 1 and July 1 of each year by Whitman, Requardt and Associates and Benjamin L. Smith & Associates. (See page 119.) Individual series for 81 cost elements in three classes of utility construction, for five geographic divisions of United States.

Weighting based on wide experience in cost analysis of plant and construction. Material prices from Engineering News-Record, Iron Age and various manufacturers. Labor rates from Utilities, Unions and Builders Associations. Base: 1911-'14 =100. The reinforced concrete building construction series is tabulated in this table.

RAILROAD CONSTRUCTION INDEX (ICC-RR)—Compiled by Engineering Section, Bureau of Valuation, Interstate Commerce Commission. (See page 115). Indexes for road (47 subseries), equipment (8 subseries), and general expenditures (7 subseries), for national average and 8 regional areas. Series quoted here is road, subseries 16, station and office buildings, national average. Computed from analysis of contracts covering major construction projects over 30-year period, and other information furnished by carriers. Base: 1910-14=100.

ABERTHAW—New England, seven-story and basement (62'4"x202'4"), reinforced concrete building built in 1914, repriced quarterly as a construction bid to duplicate original building. Labor costs based on current experience with similar construction. Base: 1914=100.

AUSTIN INDUSTRIAL BUILDING COST—Repricing typical one-story, steel frame, monitor type industrial building at regular intervals. Structure has concrete foundations, curtain walls of brick and large areas of steel sash and glass; concrete floor laid on ground; 2-in. lumber roof deck on heavy timber covered with 4-ply waterproofing. Monitor sash equipped with mechanical operators. Pricing at representative points in central and eastern states. Base: 1926=100. Table series converted to 1913=100. See also chart page 113.

FRUIN-COLNON—Industrial plant of five buildings in St. Louis repriced on basis of contractor's actual and estimated material and labor costs. Base: 1913=100.

GEORGE A. FULLER COMPANY—Composite of 36 major cost elements, in three commercial type buildings, including mechanicals, elevators, wiring, heating and ventilating, repriced. Base 1913=100.

TURNER CONSTRUCTION COMPANY—Eastern cities. Own building cost experience applied to these factors: labor rates, material prices, productivity of labor, efficiency of plant and management, competitive conditions. Base: 1913=100.

Reprints of the colored insert charts on Construction and Building Cost Indexes are available from the *Engineering News-Record* editorial offices, 330 West 42nd Street, New York 18, N. Y., as flat unfolded wall charts, 2 copies for $1.00. Special rates on larger quantities.

Construction and Building Cost Indexes—1913 through 1945

	Weighted Indexes					Aggregative Indexes						
Year Base = 100	ENR Const. 1913	ENR Bldg. 1913	AAC (New) 1913	AGC 1913	Boeckh New York 1913	Handy R. C. Aii. Seab'd. 1911-'14	ICC-RR Sta. & Off. Bldg. 1910-'14	Aber-thaw 1914	Austin Co. 1913	Fruin-Colnon 1913	Fuller 1913	Turner 1913
1913.....	100	100	100	100	100	...	...	...	100	100	100	100
1914.....	89	92	98	99	102	...	...	100	105	102	102	100
1915.....	93	95	101	100	99	...	101	100	115	102	130	103
1916.....	130	131	116	114	116	153	115	107	141	108	143	120
1917.....	181	167	143	152	135	233	135	126	172	128	156	147
1918.....	189	159	177	175	155	242	154	147	206	173	160	166
1919.....	198	159	229	198	171	237	185	172	198	174	168	196
1920.....	251	207	283	247	230	260	215	234	241	227	209	252
1921.....	202	166	216	200	193	207	192	179	180	197	188	183
1922.....	174	155	200	184	187	165	180	170	157	188	175	175
1923.....	214	186	224	201	215	199	194	202	181	217	190	196
1924.....	215	186	222	202	215	226	193	198	181	223	194	194
1925.....	207	183	217	199	211	219	188	195	185	222	193	195
1926.....	208	185	217	197	230	213	184	197	185	218	202	195
1927.....	206	186	217	200	223	208	189	193	178	214	197	190
1928.....	207	188	217	199	238	205	188	191	172	213	196	190
1929.....	207	191	217	203	242	211	187	190	170	211	201	185
1930.....	203	185	200	200	238	200	182	186	155	207	199	165
1931.....	181	169	178	196	230	184	165	176	131	196	180	145
1932.....	157	141	155	171	208	165	141	168	117	178	157	136
1933.....	170	148	150	163	197	159	145	170	117	181	155	140
1934.....	198	167	161	178	209	186	151	176	128	191	171	160
1935.....	196	166	162	176	200	190	151	177	139	185	167	162
1936.....	206	172	170	179	205	192	157	184	150	188	168	169
1937.....	235	196	198	188	226	208	166	199	165	210	187	192
1938.....	236	197	199	189	243	210	166	191	161	207	192	188
1939.....	236	197	200	188	248	206	166	190	152	208	195	182
1940.....	242	203	204	189	251	210	177	193	163	211	196	193
1941.....	258	211	217	198	255	228	188	207½	198	220	206	215
1942.....	276	222	241	200	260	252	208	223	213	227	229	245
1943.....	290	229	252	216	264	254	219	225	215	235	238	257
1944.....	299	235	261	223	284	257	227	227	223	241	240	244
1945.....	308	239	271	231	294	260	...	236	234	247	241	263

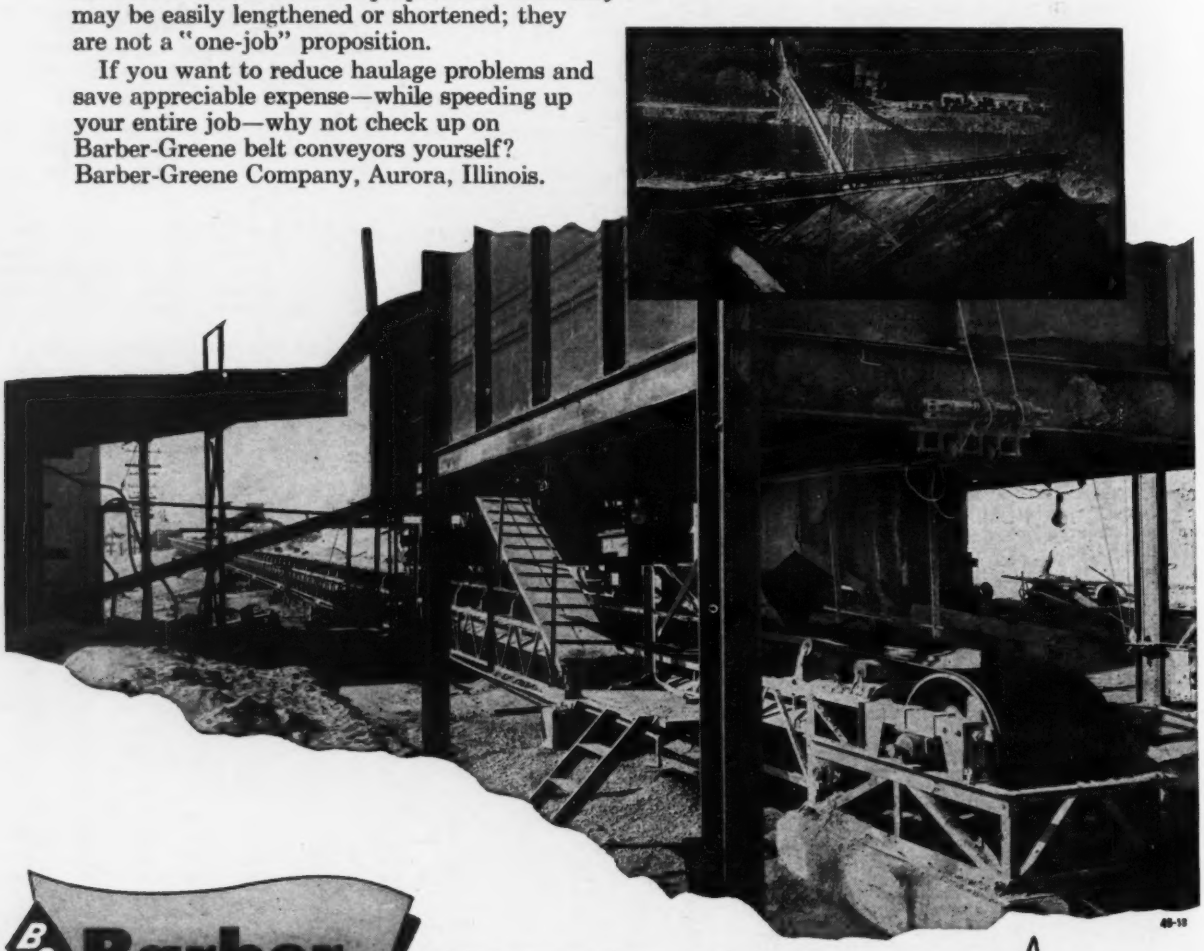
How B-G Belt Conveyors Can Cut Your Hauling Costs!

• If you've bulk materials to haul between your job and stock pile, railroad siding or mixing plant, don't overlook B-G belt conveyors.

These pre-engineered belt conveyors are widely preferred for short hauls uphill and down, across gullies, tracks, rivers and other obstructions. Wherever used, they carry a constant flow of materials at a cost per yard so low that other methods seldom can compete with them successfully.

Barber-Greene belt conveyors are prefabricated, "packaged" units—simply built, easily erected. They often pay for themselves by eliminating the cost of rail or roadbed preparation. And they may be easily lengthened or shortened; they are not a "one-job" proposition.

If you want to reduce haulage problems and save appreciable expense—while speeding up your entire job—why not check up on Barber-Greene belt conveyors yourself? Barber-Greene Company, Aurora, Illinois.



B-G Barber-Greene CONSTANT FLOW EQUIPMENT

LOADERS • PERMANENT CONVEYORS • DITCHERS • PORTABLE CONVEYORS • FINISHERS • BITUMINOUS PLANTS • COAL MACHINES

Additional Bases for Engineering News-Record Cost Indexes

For convenience in comparing cost index rises with prewar conditions the *Engineering News-Record* Construction and Building Cost Indexes are given here for three bases 1926 = 100, 1939 = 100 and 1940 = 100. Many postwar projects had their cost estimates based on 1940 price and wage levels with the proviso that these estimates should be adjusted to future postwar conditions in proportion to the rise in the *Engineering News-Record* Cost Indexes. This 1940 = 100 base series will aid in making these adjustments.

The full historical record of the *Engineering News-Record* Cost Indexes is reported on a preceding page based on 1913 = 100. To convert from this original base, on which these indexes are computed, to other bases the accompanying conversion table can be used.

BASE CONVERSION TABLE

To convert Engineering News-Record Construction and Building Cost Indexes

From Base 1913 = 100 To Base	Divide 1913 = 100 Index Values for Construction Cost Index Divide by	for Building Cost Index Divide by
1940 = 100	2.4196	2.0281
1939 = 100	2.3551	1.9744
1926 = 100	2.0803	1.8499
1929 = 100	2.0702	1.9086
1910–14 = 100	.9380	.9477
1924 = 100	2.1536	1.8578
1923–25 = 100	2.1204	1.8481
1914 = 100	.8856	.9191
1911 = 100	.9343	.9414

Year	ENR Construction Cost Index			ENR Building Cost Index		
BASE	'26 = 100	'39 = 100	'40 = 100	'26 = 100	'39 = 100	'40 = 100
1926 Aver.	100.0	88.3	85.9	100.0	93.6	91.2
1927	99.1	87.5	85.2	100.6	94.4	91.7
1928	99.4	87.8	85.4	101.6	95.2	92.6
1929	99.5	87.9	85.5	103.1	96.6	94.1
1930	97.5	86.1	83.8	100.2	93.9	91.4
1931	87.1	77.0	74.9	91.3	85.7	83.5
1932	75.4	66.6	64.8	75.7	71.3	69.4
1933	81.8	72.2	70.3	79.5	74.8	72.8
1934	95.2	84.1	81.8	90.1	84.4	82.1
1935	94.4	83.4	81.8	89.6	83.9	81.7
1936	99.2	87.6	85.3	93.1	87.2	84.9
1937	112.7	99.6	97.0	106.1	99.3	96.7
1938	113.3	100.1	97.4	106.4	99.6	97.0
1939	113.2	100.0	97.3	106.7	100.0	97.3
1940	116.3	102.7	100.0	109.6	102.7	100.0
1941	124.0	109.4	106.5	114.3	107.1	104.2
1942	132.8	117.3	114.1	120.2	112.6	109.6
1943	139.4	123.1	119.8	123.7	115.8	112.8
1944	143.6	126.8	123.4	126.9	118.8	115.7
1945 Aver.	147.9	130.6	127.1	129.3	121.1	117.8
1946 April	160.8	142.0	138.2	137.5	128.7	125.3

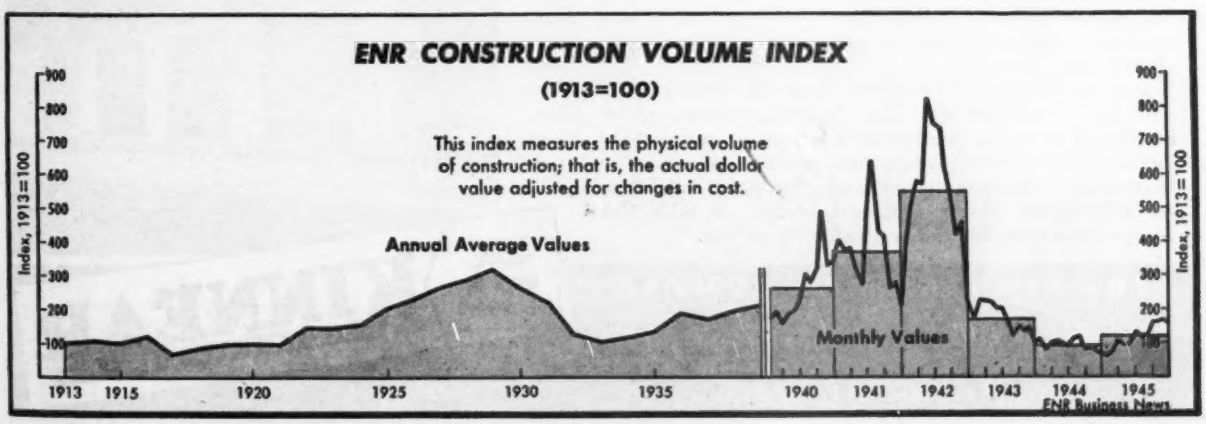
Engineering News-Record Construction Volume Index

As construction costs rise the physical volume of construction materials and labor per dollar invested declines proportionately. The *Engineering News-Record* Construction Volume Index is computed to measure the trend in physical construction. Other construction volume trends are based on dollars invested. For example, March, 1946 construction dollar volume is up 152 percent over March, 1945, whereas the *ENR* Construction Volume Index shows only a 148 percent increase in physical volume, due to the rise in construction costs in this period.

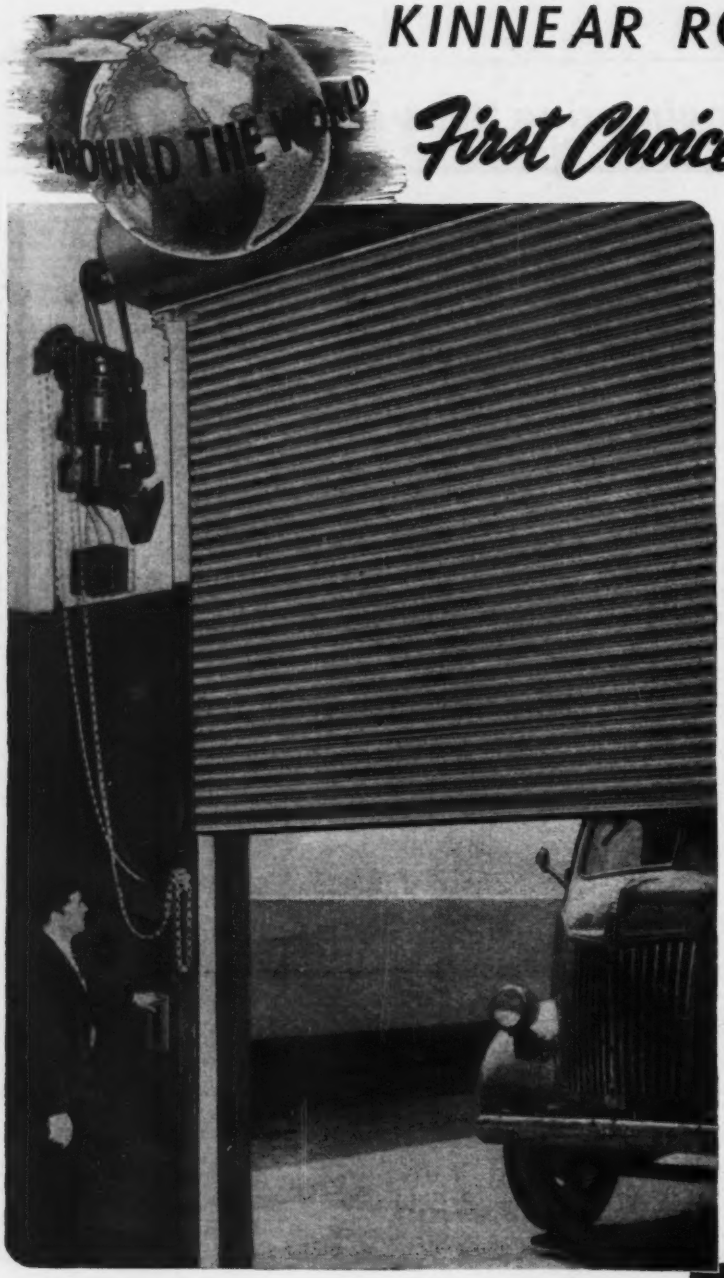
Engineering News-Record Construction Volume Index — 1913 = 100

	'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42	'43	'44	'45	'46
Jan.	71	48	93	69	57	38	138	52	100	151	125	141	198	187	208	325	199	208	121	120	149	131	248	168	172	287	173	402	402	172	114	63	189
Feb.	83	76	95	47	151	91	130	55	68	129	144	145	187	182	225	378	204	198	105	82	156	75	177	181	189	187	196	374	507	231	86	78	167
Mar.	142	75	90	55	90	52	113	90	185	162	161	161	240	223	318	382	408	278	97	63	130	101	157	146	188	210	162	381	578	228	103	103	256
Apr.	113	82	137	65	58	78	134	109	161	186	159	211	233	257	316	332	330	289	135	65	109	130	165	160	176	221	191	322	559	225	105	99	.....
May	155	96	129	50	67	80	126	108	221	149	191	209	254	290	299	395	334	251	149	103	101	107	148	214	167	232	201	275	821	203	100	93	.....
June	128	105	129	57	105	129	92	119	178	173	149	214	246	207	308	347	324	243	131	109	119	120	193	246	166	193	225	492	752	204	91	133	.....
July	139	129	136	87	107	122	83	115	146	151	161	178	248	252	236	320	228	248	166	65	128	93	187	197	207	166	308	635	736	175	114	119	.....
Aug.	118	126	130	63	111	135	86	116	137	100	162	266	252	305	303	290	259	187	111	73	94	138	197	152	215	228	281	434	622	119	121	119	.....
Sept.	95	116	145	166	145	113	80	103	149	166	159	262	227	273	296	340	232	223	124	122	101	125	201	150	213	190	324	419	544	155	85	164	.....
Oct.	108	101	97	87	67	207	79	130	154	154	164	233	244	269	363	273	211	229	137	162	98	139	180	167	217	222	490	263	421	142	91	167	.....
Nov.	84	150	105	76	66	71	57	103	114	121	128	194	211	272	251	245	207	180	137	133	115	169	163	148	199	219	331	282	462	149	74	173	.....
Dec.	62	89	106	49	27	41	63	117	134	123	145	206	188	319	244	166	192	133	113	116	105	252	208	143	249	172	344	217	227	103	66	163	.....
Aver.	107	100	119	67	88	98	99	96	147	146	154	201	228	263	287	317	260	220	127	102	114	134	185	172	197	211	299	375	553	176	95	123	.....
1926 = 100	47	44	52	39	38	43	43	42	64	64	68	88	100	115	126	139	114	96	56	45	50	59	81	75	86	92	118	164	243	77	42	54	.....

New value reported in *Engineering News-Record* each month.

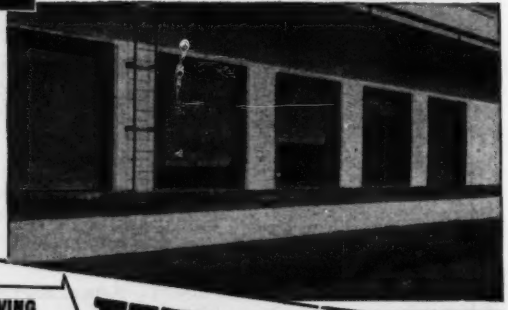


KINNEAR ROLLING DOORS are First Choice for Efficiency!



● There are many sound reasons why KINNEAR Rolling Doors have gained an outstanding, worldwide reputation for reliable, all-weather, space-saving performance. ● They are of rugged, all-steel construction — built throughout to withstand the punishing effects of frequent day and night duty. ● The KINNEAR-originated, interlocking-steel-slat curtain combines strength with flexibility, resists fire and wear, absorbs shocks and blows. Any number of individual slats can be quickly and easily replaced. ● The spring-counterbalanced, *upward operation* of KINNEAR Doors is swift and easy, saves floor, wall, and ceiling space. ● KINNEAR Rolling Doors simply coil into a compact unit above the lintel. Always out of the way when open, never a hindrance to traffic or plant operations. ● KINNEAR presents a sturdy, steel barrier to theft, weather, wind, intrusion, and accidental damage. ● KINNEAR Doors are standard in design, but adapted to fit any size opening in new or old buildings. ● In every detail, KINNEAR Rolling Doors are made to assure economical and long-lasting, useful service. ● Write for complete information on KINNEAR Rolling Doors for your requirements.

KINNEAR MOTOR OPERATORS — The smooth, easy, *coiling action* of the famous KINNEAR interlocking-steel-slat curtain is even more efficient when combined with time-saving electric door control! At the touch of a button, KINNEAR Doors can be opened or closed from the door jamb or from any desired number of other convenient locations. A whole battery of doors can be controlled from a central point. Saves labor and promotes prompt door closure, which in turn cuts heating and air-conditioning costs. Write for full details on KINNEAR Motor Operated Doors, or KINNEAR Motor Operators for doors already in service.



SAVING WAYS IN DOORWAYS

KINNEAR ROLLING DOORS

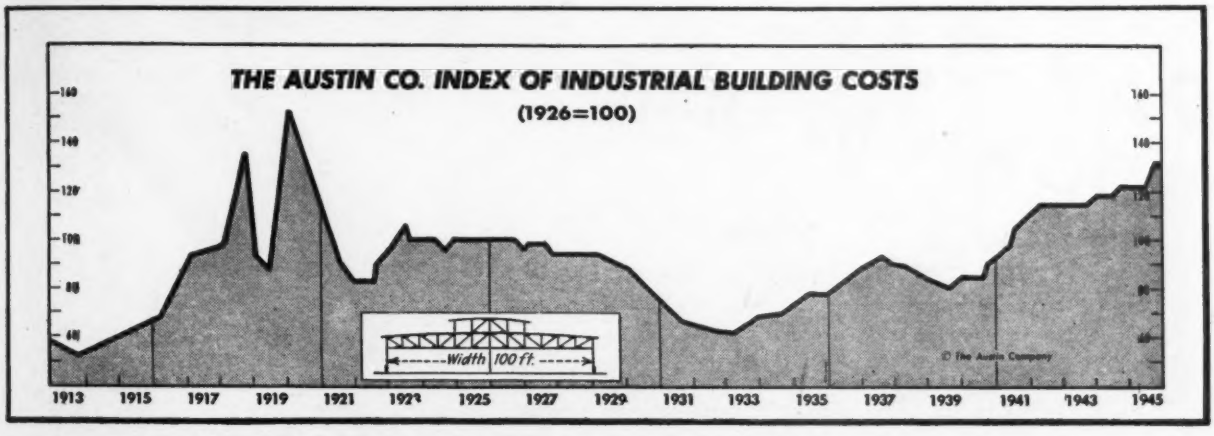
THE KINNEAR MFG. COMPANY
FACTORIES
1820-40 Fields Ave. Columbus 16, Ohio
1742 Yosemite Ave. San Francisco 24, Calif.
Offices and Agents in Principal Cities

American Appraisal Company Construction Cost Trend Index — 1913 = 100

For average of four types of buildings: All Frame, Brick-Wood Frame, Brick-Steel Frame and Reinforced Concrete. These indices cover structural items only, and do not include factors for Plumbing, Heating, Lighting, Elevators, etc.

	'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42	'43	'44	'45
U. S. AVER.	98	101	116	143	177	229	283	216	200	224	222	217	217	217	217	217	200	178	155	150	161	162	170	198	199	200	204	218	241	252	261	271
	24 Cities																				30 Cities											
Boston	100	103	118	149	183	234	288	220	209	232	229	224	224	222	222	224	212	195	169	163	170	169	178	212	209	210	214	225	248	254	260	270
New York	99	100	115	142	175	227	299	245	219	245	241	230	234	234	235	237	219	201	170	167	176	174	182	213	216	219	223	233	248	254	265	272
Buffalo	98	99	115	144	180	232	278	214	197	228	225	218	219	217	213	212	195	178	157	150	160	158	165	202	206	205	207	221	247	256	270	279
Baltimore	97	99	116	150	193	239	289	215	206	233	229	226	224	226	227	228	211	186	166	158	167	173	180	200	200	198	200	220	248	256	265	277
Philadelphia	98	102	115	145	181	236	300	220	201	232	230	224	225	228	227	227	209	190	161	156	166	166	171	193	194	196	207	225	247	254	263	273
Pittsburgh	97	99	115	142	179	231	290	221	201	228	238	233	236	237	236	236	217	198	172	161	170	168	177	211	219	219	219	225	249	259	266	279
Cincinnati	99	100	115	143	173	217	276	211	194	221	221	219	217	219	219	220	202	176	157	151	161	162	174	206	209	209	213	223	242	250	266	272
Cleveland	97	99	120	149	179	233	303	227	210	241	243	236	233	231	232	232	213	188	160	151	164	168	175	208	207	206	209	224	245	249	258	268
Chicago	97	100	116	141	170	224	294	236	202	228	225	224	219	222	222	222	205	185	162	156	166	169	179	204	205	205	207	216	235	244	250	260
Indianapolis	102	104	119	146	175	221	279	221	202	225	227	222	219	222	224	224	206	182	157	150	161	161	169	199	204	205	209	233	247	257	266	276
Detroit	99	102	122	150	187	244	304	220	200	229	227	226	224	222	221	220	202	174	148	146	157	160	168	203	205	207	212	226	252	259	268	278
Milwaukee	100	103	120	150	178	237	290	212	195	224	224	217	218	219	220	218	197	163	144	141	156	163	178	208	208	209	213	225	254	264	269	280
Minneapolis	98	100	114	142	171	218	277	210	193	214	208	201	197	197	197	198	182	165	148	146	154	154	162	199	201	202	203	214	235	241	251	266
Kansas City	98	102	120	150	184	239	280	220	211	231	228	220	220	215	213	213	193	178	156	149	160	162	169	202	209	209	211	221	239	249	256	268
St. Louis	97	100	114	141	175	228	284	225	204	228	238	233	230	226	225	224	205	188	163	156	166	164	171	207	207	207	211	220	238	245	253	265
Atlanta	97	98	111	140	186	250	304	218	202	226	217	209	211	214	215	215	195	173	147	142	162	163	170	192	185	187	193	215	240	257	267	278
Dallas	100	105	121	145	176	227	274	209	191	209	206	198	204	204	202	202	187	168	146	139	149	148	154	170	168	171	173	187	209	224	236	246
New Orleans	97	96	113	136	174	239	282	217	201	225	227	216	217	218	215	215	198	170	145	141	159	159	166	186	187	194	202	214	234	244	259	277
Denver	100	102	118	145	171	216	262	206	191	202	206	204	204	202	205	207	189	168	149	141	150	151	157	190	193	195	199	209	226	233	237	245
Seattle	96	101	115	141	176	224	268	197	186	207	206	201	199	195	194	198	184	159	141	136	150	154	161	194	193	195	200	219	244	255	267	277
San Francisco	97	104	118	139	169	214	258	204	189	208	199	194	188	188	188	190	177	158	144	138	145	144	155	178	176	180	181	201	225	232	237	244
Los Angeles	97	102	112	133	162	213	251	208	199	213	204	197	195	193	193	196	178	157	141	134	142	140	143	165	166	167	166	183	213	236	240	249

NOTE — These construction cost index figures are based on 1913 as 100% for each individual location, thus indicating the trend in each city and not the trend between the various locations. The index figures are calculated on the basis of normal average material prices, average labor wages, and the market conditions in the individual cities and do not reflect extremes such as premium prices and overtime wages for rush work during boom periods or the "extreme low" of cut-throat practices during the "depression periods."



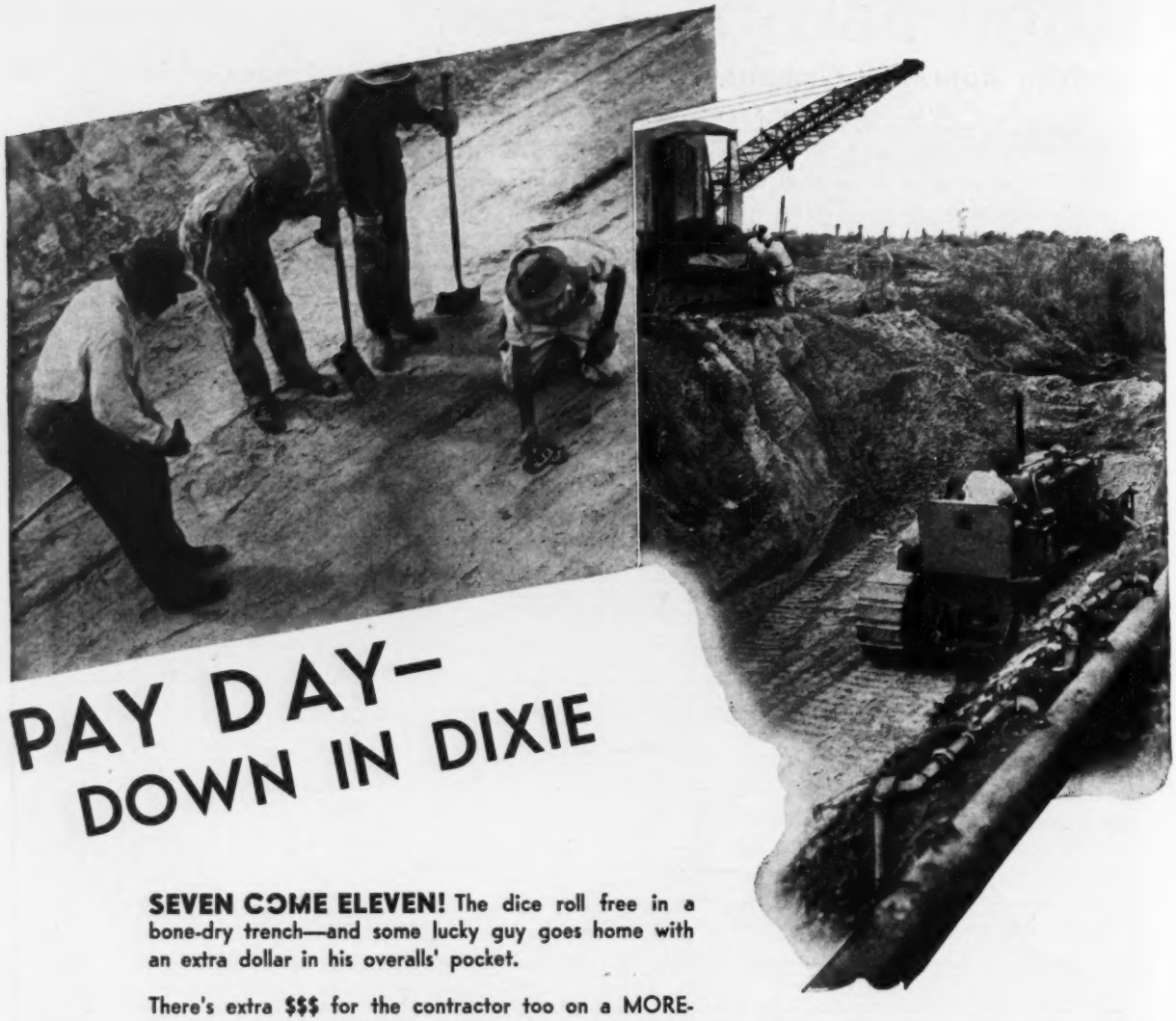
Labor, Material and Man-Hour Estimates per $1,000,000 Expenditure for Various Types of Federal Construction Projects

Projects Completed or In Process During 1945—Estimated by U. S. Dept. of Labor, Bu. of Labor Statistics, Employment and Occupational Outlook Branch, Div. of Construction and Public Employment

Type of project	Expenditures (thousands of dollars)			Percent of labor and material		Man-hours worked		
	Labor at construction site	Material	Labor and material	Labor	Material	At construction site	Off-set labor	Total
Building construction:								
Residential	360	440	800	45.0	55.0	263,400	395,100	658,500
Non-residential								
Military buildings[1]	368	468	836	44.0	56.0	285,700	371,400	657,100
Industrial buildings	334	501	835	40.0	60.0	259,300	363,000	622,300
Hospitals	342	476	818	41.8	58.2	265,500	398,300	663,800
All other types	332	489	821	40.4	59.6	257,800	386,700	644,500
Non-building construction:								
Water and sewerage systems	326	484	810	40.2	59.8	290,600	377,800	668,400
Reclamation projects	341	409	750	45.4	54.6	267,900	428,600	696,500
Streets, roads and highways	334	367	701	47.6	52.4	286,700	401,400	688,100
Airports[2]	324	467	791	41.0	59.0	253,700	380,100	633,800

[1] Includes barracks, mess halls, recreation buildings, etc., at military posts and stations.

[2] Exclusive of buildings.



PAY DAY— DOWN IN DIXIE

SEVEN COME ELEVEN! The dice roll free in a bone-dry trench—and some lucky guy goes home with an extra dollar in his overalls' pocket.

There's extra **$$$** for the contractor too on a MORETRENCH job. Dry digging is fast—easy to handle—economical. Expensive sheeting and bracing are frequently eliminated. Time and money saved at every turn.

These are facts—not fancies. Proof lies in the great volume of repeat orders that make up our business. For example, *the above sewer trench is the **7th** project in the past four years dewatered by Moretrench for Boh Bros. Const. Co. of New Orleans.*

Whenever you tackle a wet job, the dice are loaded against you. A MORETRENCH WELLPOINT SYSTEM can change that. Write, wire or phone us. Large or small, your job will receive our immediate attention.

CATALOG ON REQUEST

●

MORETRENCH CORPORATION

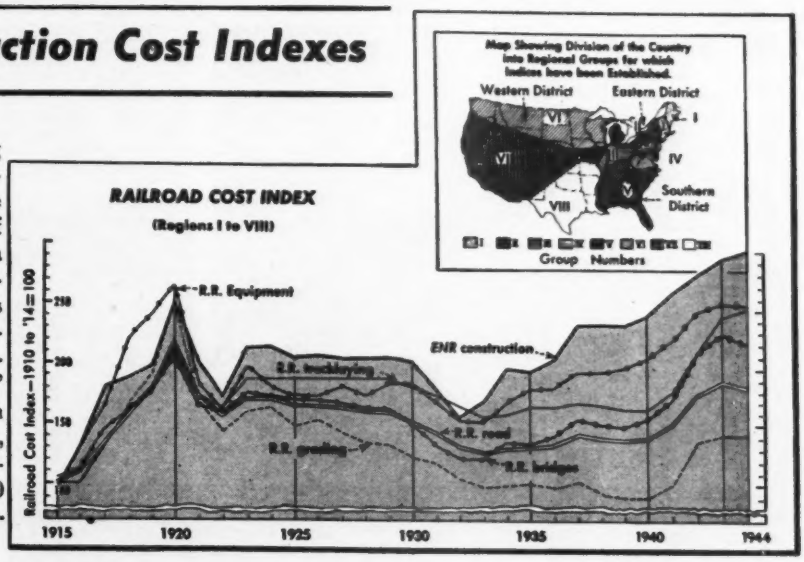
90 WEST STREET, NEW YORK 6

ROCKAWAY, NEW JERSEY

CHICAGO 23, ILL. • HOUSTON 8, TEX. • TAMPA 6, FLA.

Railroad Construction Cost Indexes

THESE INDEXES by Engineering Section, Bureau of Valuation, Interstate Commerce Commission, include items developed from analysis of major construction contracts over a period of 30 years. Indexes for material accounts are based on studies of carriers' returns to Valuation Order 14, joint studies made with various sub-committees of Presidents' Conference Committee, well-known engineering and trade publications, contracts covering major construction projects over a period of 30 years, and other information furnished by individual carriers.



Railroad Cost Indexes for Regions by Years for "Road" Construction — 1910-14 = 100

Total of Accounts 1-46, ROAD, Engineering Section, Bureau of Valuation, Interstate Commerce Commission, August 1, 1945

United States	Per Cent	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
Reg. I to VIII....	**73.09**	**175**	**157**	**171**	**171**	**166**	**166**	**164**	**161**	**160**	**152**	**143**	**131**	**127**	**131**	**131**	**133**	**142**	**138**	**137**	**140**	**151**	**175**	**186**	**187**
Reg. I.....	75.36	178	163	177	178	172	173	171	167	166	158	148	134	131	133	134	136	146	141	140	144	156	180	193	194
Reg. II.....	68.15	176	160	174	174	168	168	167	165	164	157	145	133	130	134	134	136	146	142	141	145	156	178	189	191
Reg. III.....	67.99	176	160	173	173	169	168	167	164	163	155	143	132	129	133	133	136	146	142	144	146	157	179	192	194
Reg. IV.....	70.49	173	152	167	166	164	163	159	155	154	145	133	126	122	125	126	127	137	132	131	135	146	172	184	186
Reg. V.....	76.66	171	153	168	167	163	164	160	156	156	148	137	129	125	129	128	131	141	137	136	139	149	175	185	186
Reg. VI.....	77.41	175	155	169	170	163	164	162	158	158	150	138	129	125	128	128	129	139	134	132	135	145	171	182	183
Reg. VII.....	75.62	177	158	170	170	165	166	163	160	158	151	139	131	128	130	129	131	140	135	133	135	145	162	179	181
Reg. VIII.....	78.15	173	157	171	171	166	167	164	161	161	154	143	133	130	133	134	135	144	141	140	142	153	175	187	187

(Indexes represent territorial index factors and are not necessarily applicable for determining unit reproduction costs upon individual roads.)

Railroad Cost Index by Accounts Applicable to Entire U. S., Regions I to VIII, Inclusive

"Road" Construction	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
Engineering	175	157	171	171	166	166	164	161	160	152	143	131	127	131	131	133	142	138	137	140	151	175	186	187
Grading	170	143	160	164	149	153	143	135	133	123	118	106	98	100	101	99	103	93	90	90	99	135	142	143
Underground Power Tubes																								
Tunnels and Subways	179	165	179	179	179	178	169	155	155	143	130	119	111	122	120	130	139	141	140	149	160	192	223	219
Bridges, Culverts, etc.	165	160	176	173	171	170	168	164	163	150	134	122	122	136	135	141	155	150	149	156	174	210	227	222
Elevated Structures	150	153	173	171	168	165	163	163	162	154	144	129	122	136	136	137	158	150	149	159	175	209	236	231
Ties	189	157	177	175	172	173	175	176	175	170	155	144	139	149	147	150	159	154	158	164	181	199	228	234
Rails	158	144	145	145	144	144	144	144	144	144	144	140	134	123	123	124	143	139	136	138	139	144	144	146
Other Track Material	192	161	182	179	177	177	177	177	170	169	165	163	158	150	147	150	169	169	167	167	170	175	173	172
Ballast	191	176	175	175	174	175	176	176	176	168	159	146	146	141	139	140	143	143	143	143	153	170	175	175
Track Laying and Surfacing	174	165	188	188	188	188	188	188	188	182	175	164	157	159	165	165	169	167	165	165	178	209	241	252
Right-of-way Fences	189	177	179	179	176	175	175	175	173	171	164	147	135	140	140	138	143	144	139	139	147	165		
Snow, Sand Fences, Sheds	197	194	212	200	201	201	204	204	204	198	188	125	126	140	140	140	155	155	155	155	164	174	179	179
Crossings and Signs	171	164	178	175	171	169	166	165	165	161	153	131	127	139	137	139	152	145	142	146	163	198		
Station and Office Bldgs.	192	180	194	193	188	184	189	188	187	182	165	141	145	151	151	157	166	166	166	166	177	188	208	219	227
Roadway Buildings	192	178	196	196	189	187	192	191	190	186	166	140	145	150	150	150	162	162	162	162	177	186	206	226	237
Water Stations	185	178	187	187	186	182	185	186	184	177	161	147	151	155	155	156	166	166	166	166	172	185	195	208	196
Fuel Stations	181	166	185	185	182	180	183	183	183	174	159	144	149	154	154	153	159	159	159	163	187	205	216	222
Shops and Engine Houses	191	180	193	192	188	185	189	188	187	176	161	137	142	147	147	155	165	165	165	165	176	188	204	216	223
Grain Elevators	190	184	197	197	193	190	195	193	193	182	165	137	142	147	147	156	164	164	164	166	200	208	213	217
Storage Warehouses	193	178	198	198	193	189	193	191	191	184	165	137	142	147	147	154	166	166	166	176	195	207	218	226
Wharves and Docks	167	158	175	175	174	177	178	178	178	172	158	136	141	146	146	149	153	153	153	161	167	212	226	234
Coal and Ore Wharves	170	159	176	176	174	174	176	176	176	172	157	136	142	147	147	151	153	153	153	160	185	199	211	215
Gas Producing Plants	194	176	188	189	186	185	188	189	189	178	163	145	148	176	176	178	178	177	179	188	198	200		
Telegraph and Telephone Lines	191	162	187	179	163	157	163	165	165	150	138	121	119	124	128	131	135	129	129	134	143	156	165	165
Signals and Interlockers	163	158	165	164	162	169	158	155	154	147	138	130	130	133	136	138	143	143	143	146	156	165	176	176
Power Dams, Canals, Pipe Lines																151	149	149	149	150	181	185		
Power Plant Buildings	197	184	196	196	191	186	191	191	189	177	162	138	143	148	148	152	167	167	167	176	194	204	213	219
Power Substation Buildings	194	180	197	197	192	188	193	191	190	176	161	137	142	147	147	138	164	164	164	175	187	203		
Power Transmission System	145	132	142	136	140	141	137	142	150	136	116	98	98	103	105	108	123	110	110	114	119	121		
Power Distribution System	172	163	178	172	175	176	175	178	181	173	148	144	144	148	151	152	155	149	149	155	163	165		
Power Line Poles, Fixtures	208	179	209	203	185	183	198	199	209	200	172	147	147	150	153	148	157	152	152	152	173	195		
Underground Conduits	228	214	220	215	220	216	219	219	217	215	175	175	175	180	184	185	185	185	185	185	190	209		
Miscellaneous Structures	192	179	195	195	190	186	191	190	189	182	164	141	146	151	151	154	161	161	161	168	178	183	198	208
Paving	191	190	191	191	191	190	190	190	190	190	181	156	150	145	145	145	150	150	150	150	171	190		
Roadway Machines	192	149	151	151	151	151	151	149	148	147	144	138	138	147	147	147	161	153	154	158	169	169	187	187
Roadway Small Tools	191	170	173	185	190	190	191	191	190	160	155	155	150	150	150	160	170	180	180	190	190	200	200	200
Shop Machinery	198	173	183	185	185	186	187	189	191	176	166	155	155	179	179	179	198	200	202	212	224	224	228	227
Power Plant Machinery	198	173	183	185	185	186	187	189	191	176	166	155	155	168	168	171	180	177	180	189	194	194	190	212
Power Substation Apparatus	198	173	183	185	185	186	187	189	191	176	166	155	155	155	150	145	149	151	150	158	160	160		

ANY CONCRETE ROAD – ANYWHERE . . .
is better with TRUSCON Welded Steel Fabric
On every type of terrain—from mountain top to swampland—Truscon Welded Steel Fabric provides longer life and lower ultimate cost for concrete highways because it assures:
Resistance to cracking during setting period.
Tensile strength against subgrade friction.
Resistance to cracking due to warping.
Resistance to development and opening of cracks.
Resistance to slab separation.
Decrease of spalling and disintegration.
Truscon Welded Steel Fabric and associated Truscon Steel roadbuilding products give adequate protection to public funds invested in highways, and will build greater prestige for you. An experienced Truscon highway engineer will help on any concrete road-building problem you may have.
TRUSCON STEEL COMPANY • YOUNGSTOWN 1, OHIO • Subsidiary of Republic Steel Corporation
TRUSCON
WELDED STEEL FABRIC

Boeckh Index of Construction Costs—U. S. Average, 1926–'29 = 100

Annual Averages By Cities	Residences		Apartments, Hotels, Office Bldgs.			Commercial & Factory Bldgs.				
			Brick and					Brick and		
	Frame	Brick	Wood	Conc.	Steel	Frame	Steel	Wood	Steel	Conc.
ATLANTA AREA										
1926–29	82.7	87.0	84.2	83.7	87.0	82.9	94.5	84.7	87.5	88.8
1939	82.8	86.0	86.1	95.1	95.0	80.6	96.2	88.6	94.6	97.4
1940	88.1	90.3	90.6	96.8	97.3	86.3	100.1	91.5	97.3	98.4
1941	96.2	97.5	97.9	99.6	100.7	95.2	103.0	96.9	100.7	101.2
1942	102.5	102.8	102.8	104.4	105.1	101.1	106.3	101.4	105.1	104.9
1943	109.8	109.2	109.3	108.5	110.0	110.0	109.0	107.2	108.7	108.1
1944	124.5	123.2	123.5	117.3	120.0	126.1	117.2	120.7	118.2	117.2
1945	133.9	132.1	132.5	123.2	127.0	135.9	120.7	130.1	123.3	122.8
BALTIMORE AREA										
1926–29	107.2	112.0	107.6	100.6	100.7	106.3	95.5	106.8	96.8	101.2
1939	93.5	95.5	95.6	99.3	99.2	94.0	101.7	96.6	101.4	100.2
1940	100.1	101.3	102.0	102.5	103.0	101.0	105.3	102.7	106.1	103.3
1941	109.2	109.9	110.4	107.4	108.1	111.2	108.3	109.7	110.8	108.2
1942	115.1	115.0	115.1	113.6	113.9	115.9	112.2	114.4	116.6	114.2
1943	120.8	121.3	121.7	118.9	118.8	122.6	115.6	120.6	120.8	119.4
1944	136.3	134.9	135.3	126.7	128.6	139.6	123.4	132.2	129.0	127.5
1945	147.4	145.8	146.0	134.9	137.1	150.9	129.4	141.9	136.4	135.4
BIRMINGHAM AREA										
1926–29	91.7	96.7	94.1	95.5	96.8	90.2	97.5	94.6	96.3	96.3
1939	87.8	90.9	91.5	96.1	96.2	84.9	96.9	95.1	95.6	96.3
1940	92.4	94.0	94.5	95.2	96.0	91.4	97.8	97.7	96.5	96.7
1941	100.8	101.3	101.8	98.9	100.7	100.6	100.7	102.6	100.3	99.1
1942	108.4	110.8	110.6	110.7	111.0	108.7	107.8	111.3	110.6	112.5
1943	111.6	113.6	113.5	113.2	113.6	112.3	109.5	113.8	112.7	115.0
1944	124.6	125.1	125.2	119.7	121.7	125.5	114.6	124.1	119.0	120.9
1945	135.2	135.1	135.7	127.1	121.1	136.2	120.8	133.5	126.2	127.7
BOSTON AREA										
1926–29	116.3	120.3	115.4	106.2	107.0	118.8	106.3	112.5	108.7	105.8
1939	106.2	110.4	110.1	116.3	113.7	105.7	114.2	111.5	118.2	118.5
1940	111.7	114.7	114.3	116.9	114.9	112.3	114.6	114.6	119.1	119.2
1941	121.3	122.4	122.2	118.1	117.6	123.4	115.9	119.3	121.1	120.2
1942	128.4	129.4	129.0	124.3	123.6	131.5	120.1	123.7	126.3	126.3
1943	135.2	135.7	135.2	130.0	129.0	139.0	124.3	130.7	132.0	132.5
1944	145.3	144.2	143.8	136.4	136.4	149.9	132.1	140.1	139.5	139.2
1945	152.5	151.1	150.9	142.1	143.2	157.4	136.7	145.8	144.6	145.0
CHICAGO AREA										
1926–29	109.2	114.2	109.8	113.2	109.1	112.9	105.2	105.9	112.0	116.0
1939	110.6	112.5	111.1	123.6	118.7	114.2	117.6	109.3	122.6	127.6
1940	117.3	117.8	116.5	124.9	120.9	121.8	118.5	113.4	124.2	128.4
1941	126.9	125.5	124.3	126.9	124.1	132.9	119.9	118.9	126.6	129.6
1942	131.7	130.2	128.9	129.7	127.4	137.7	121.4	122.9	129.2	132.2
1943	137.8	136.2	134.8	134.7	132.0	143.9	124.0	128.9	133.7	137.0
1944	146.5	143.6	142.3	139.4	137.4	153.3	130.4	134.8	138.6	142.4
1945	150.6	154.0	152.4	147.8	146.1	163.7	135.7	145.2	146.3	151.3
CINCINNATI AREA										
1926–29	100.5	105.0	101.3	101.0	100.2	100.2	99.6	103.1	100.6	101.0
1939	103.3	106.2	105.9	113.9	110.4	103.3	111.7	107.1	113.7	116.5
1940	105.9	108.6	107.8	116.0	112.4	105.9	112.3	108.9	114.5	119.2
1941	112.8	114.0	113.7	116.5	114.5	114.6	112.8	112.6	116.0	118.1
1942	117.1	118.4	118.1	120.6	118.8	118.5	115.5	116.9	119.9	122.1
1943	122.2	125.0	124.8	124.5	123.6	126.1	118.7	123.8	124.2	126.3
1944	139.1	139.5	139.6	133.0	133.9	141.6	127.2	138.0	134.6	134.7
1945	151.2	153.1	152.1	142.7	142.8	153.1	132.8	151.7	142.9	145.1
CLEVELAND AREA										
1926–29	107.2	113.4	108.5	111.3	108.3	109.0	103.0	107.2	110.5	114.8
1939	106.2	109.6	109.5	115.3	112.8	107.5	112.9	109.5	117.7	118.0
1940	107.8	111.1	110.9	116.1	113.5	109.2	112.3	110.5	117.9	119.2
1941	118.3	120.5	120.1	122.6	120.2	121.7	116.9	118.2	124.1	125.9
1942	123.2	125.3	124.7	127.6	124.8	128.1	119.9	123.1	128.0	130.8
1943	128.6	130.0	129.4	130.3	128.1	131.9	122.0	127.0	130.3	133.2
1944	143.6	143.6	143.0	139.4	138.9	148.5	131.3	138.4	140.6	142.4
1945	154.9	154.7	153.9	148.3	147.3	158.8	136.9	149.6	148.7	151.9
DALLAS AREA										
1926–29	103.1	107.3	103.2	98.9	99.1	103.6	100.5	100.9	99.4	99.7
1939	95.1	95.8	96.7	98.8	100.2	94.8	106.6	96.0	101.9	98.9
1940	100.7	100.7	101.8	101.1	103.3	100.9	112.8	100.5	106.6	100.6
1941	110.6	109.2	110.2	103.3	106.7	112.2	112.2	106.0	108.9	102.5
1942	117.9	115.9	116.8	110.8	114.5	119.7	118.5	111.3	116.8	109.4
1943	126.3	125.5	125.9	123.4	125.6	128.1	123.8	120.9	126.8	125.7
1944	129.2	128.2	128.5	123.6	126.5	131.7	126.8	123.2	126.7	124.4
1945	135.8	134.5	134.9	127.4	131.0	138.2	129.3	130.1	130.8	127.9
DENVER AREA										
1926–29	95.0	99.7	95.5	102.4	99.6	95.5	105.5	94.6	101.4	108.0
1939	112.1	112.0	111.2	116.1	114.4	114.3	118.7	109.5	117.0	117.8
1940	110.6	111.8	111.3	117.1	115.1	111.9	119.9	111.4	118.4	119.8
1941	116.8	117.2	116.4	118.9	117.9	118.8	122.2	115.1	120.5	121.5
1942	121.8	121.8	120.4	122.5	121.9	124.2	125.1	118.7	124.2	124.9
1943	127.8	126.8	126.2	126.2	126.2	131.3	128.3	123.2	128.5	128.2
1944	139.1	137.4	137.3	132.5	134.9	142.5	133.6	133.3	135.4	132.8
1945	147.6	146.7	147.1	141.1	145.2	152.4	145.8	142.2	147.8	144.4
DETROIT AREA										
1926–29	103.3	108.4	104.3	102.9	102.4	103.7	103.1	103.5	103.3	104.4
1939	98.8	102.7	102.9	108.6	107.5	98.7	108.8	104.2	111.4	110.1
1940	103.3	106.0	106.3	109.2	108.7	103.6	109.7	106.4	111.6	110.6
1941	113.4	114.6	114.7	114.7	114.1	114.8	112.3	113.1	116.6	116.3
1942	119.0	120.6	120.5	121.3	119.9	120.3	116.3	119.4	122.5	123.1
1943	126.7	127.9	127.6	126.5	125.4	129.4	120.1	125.9	127.4	128.6
1944	140.0	140.2	140.7	134.5	135.6	143.0	131.0	137.6	138.2	135.7
1945	149.9	149.4	149.7	143.0	144.1	154.3	137.3	145.4	145.8	144.1

Annual Averages By Cities	Residences		Apartments, Hotels, Office Bldgs.			Commercial & Factory Bldgs.				
			Brick and					Brick and		
	Frame	Brick	Wood	Conc.	Steel	Frame	Steel	Wood	Steel	Conc.
KANSAS CITY AREA										
1926–29	100.3	106.5	102.2	105.7	103.3	101.1	105.9	101.9	107.5	108.8
1939	104.4	109.9	109.8	118.3	115.4	103.8	117.2	113.0	120.0	121.6
1940	109.3	114.3	113.5	119.0	116.7	109.1	117.1	115.5	121.0	122.1
1941	117.8	120.4	120.2	120.8	119.6	119.1	119.3	120.2	123.5	123.2
1942	123.1	124.7	125.0	124.6	123.6	124.7	121.7	124.8	127.1	126.5
1943	127.7	128.0	127.9	128.0	127.5	129.7	123.8	128.0	129.9	129.5
1944	138.4	137.6	137.2	133.3	134.7	142.4	134.2	133.2	136.1	134.3
1945	150.6	148.8	148.7	142.7	144.1	156.5	139.6	143.4	145.4	144.4
LOS ANGELES AREA										
1926–29	92.7	97.9	93.5	98.8	96.8	93.5	97.0	91.3	97.5	103.1
1939	93.6	97.2	97.5	103.7	105.0	95.6	109.5	96.8	106.2	104.9
1940	96.3	97.8	98.3	103.2	105.1	96.1	108.9	97.4	106.4	103.8
1941	107.5	106.7	107.6	106.5	109.6	108.4	113.8	104.2	112.4	105.6
1942	119.3	115.6	116.1	116.6	119.4	118.3	123.3	112.4	121.3	116.3
1943	123.7	122.6	122.8	122.6	125.0	127.0	128.8	118.0	127.5	122.8
1944	132.5	131.2	131.1	129.5	132.4	136.6	135.4	125.1	134.4	131.2
1945	139.8	138.3	139.0	134.9	139.4	144.4	140.9	133.3	140.4	135.0
MINNEAPOLIS AREA										
1926–29	92.8	98.2	94.6	95.6	96.1	92.8	100.0	93.9	97.9	98.4
1939	101.9	105.0	104.2	113.5	110.7	102.7	113.4	103.6	114.5	117.2
1940	106.1	108.2	107.5	113.6	111.7	107.8	113.8	105.4	115.3	117.2
1941	116.6	116.9	116.2	116.4	115.9	120.0	115.8	112.3	118.7	119.9
1942	121.2	121.4	120.6	120.5	120.9	124.5	118.9	116.8	122.7	124.2
1943	126.0	125.4	124.6	123.2	122.9	130.5	121.1	120.0	125.5	126.3
1944	137.7	136.2	135.8	129.8	131.0	142.8	127.5	130.3	132.9	132.5
1945	149.8	150.9	150.8	141.1	141.2	152.2	132.4	149.4	142.6	143.5
NEW ORLEANS AREA										
1926–29	93.3	96.3	93.4	86.5	90.6	93.3	93.7	91.5	89.5	86.5
1939	89.0	90.3	91.3	95.4	98.3	88.1	102.8	91.7	98.5	94.9
1940	97.3	97.4	98.1	100.3	102.2	97.3	104.7	97.9	101.6	99.2
1941	106.3	105.7	105.9	106.7	108.6	107.9	112.1	104.4	108.7	106.7
1942	110.6	109.9	110.3	110.7	113.0	114.0	118.0	108.0	114.6	111.2
1943	113.1	113.1	113.4	113.4	116.0	117.0	120.0	110.6	117.3	114.0
1944	124.6	122.3	122.6	117.7	122.7	128.5	124.6	117.7	122.1	117.1
1945	136.4	134.4	134.5	127.7	131.6	139.1	131.1	130.5	131.6	128.4
PHILADELPHIA AREA										
1926–29	100.3	106.3	103.7	105.9	103.1	98.1	101.9	104.2	104.1	107.5
1939	99.2	102.6	102.9	105.7	104.1	98.2	102.0	105.0	105.5	106.7
1940	103.0	105.4	106.0	106.7	106.1	102.1	105.9	107.4	107.9	107.5
1941	113.3	114.0	114.4	111.7	111.6	113.9	109.1	113.6	113.0	111.8
1942	121.8	123.5	123.6	123.1	122.0	122.7	116.6	123.0	123.2	125.1
1943	127.6	129.0	129.2	127.2	126.7	128.6	119.6	127.4	127.1	127.5
1944	142.8	142.1	142.4	135.6	135.9	145.0	127.6	139.0	135.2	136.5
1945	152.1	151.1	151.9	141.9	143.7	155.3	131.8	147.8	141.3	142.7
NEW YORK CITY AREA										
1926–29	133.3	138.4	131.9	122.8	120.4	137.5	113.1	127.4	123.2	125.3
1939	122.1	123.3	122.5	130.6	125.9	125.6	123.7	119.6	130.0	133.3
1940	124.6	125.7	125.1	132.0	127.4	128.0	124.3	122.2	131.2	134.9
1941	134.6	134.1	133.3	135.0	131.3	139.4	126.6	128.7	134.4	137.1
1942	140.7	139.1	138.2	137.9	135.6	145.0	128.5	132.6	137.1	139.3
1943	144.5	142.5	141.6	140.2	138.0	150.0	130.3	135.8	139.0	141.7
1944	154.3	153.1	152.7	149.6	147.7	159.8	139.8	147.2	149.6	152.6
1945	161.7	160.5	160.1	156.3	155.9	167.2	144.2	155.0	155.4	158.0
PITTSBURGH AREA										
1926–29	113.2	118.8	112.8	111.2	107.1	115.4	89.6	112.2	104.6	112.9
1939	113.8	117.0	115.7	117.5	114.2	114.2	109.8	116.5	116.9	119.1
1940	115.0	117.3	116.7	117.7	114.4	115.6	109.5	117.4	116.2	119.3
1941	125.3	125.7	125.3	120.6	118.7	127.4	111.4	123.8	119.6	122.3
1942	132.7	131.1	130.6	126.0	124.4	133.9	115.4	128.6	124.8	127.6
1943	139.0	137.8	136.9	131.6	129.8	142.9	119.0	133.9	129.6	131.9
1944	149.1	147.3	146.4	138.3	137.0	153.3	125.4	142.6	136.6	139.3
1945	157.6	159.9	155.9	146.1	145.0	161.4	130.3	153.2	143.7	148.0
ST. LOUIS AREA										
1926–29	118.6	121.1	115.7	109.9	108.8	121.8	103.3	111.7	107.7	109.3
1939	107.0	110.2	109.9	118.7	116.4	107.6	114.3	110.3	119.2	119.8
1940	109.2	111.9	111.6	119.2	117.0	109.9	113.4	111.6	119.2	120.3
1941	117.0	118.7	118.5	121.1	120.2	120.1	116.7	116.3	122.1	121.5
1942	123.3	124.5	124.1	126.9	125.9	126.3	120.9	122.3	126.9	128.6
1943	126.4	128.2	128.1	131.2	129.4	129.3	123.4	126.5	130.3	133.3
1944	138.4	138.4	138.3	135.7	136.3	142.1	129.8	136.4	136.6	136.7
1945	152.3	152.8	151.4	146.2	146.4	156.2	135.9	148.1	145.6	148.5
SAN FRANCISCO AREA										
1926–29	87.7	93.7	90.4	97.5	96.5	86.1	95.5	95.5	91.8	99.0
1939	99.2	105.7	104.5	117.4	114.4	97.6	114.9	107.4	116.5	121.9
1940	100.7	106.0	106.0	116.4	114.1	99.6	112.2	108.1	115.7	120.4
1941	112.2	115.8	116.2	120.1	119.8	114.3	120.9	115.3	123.4	123.0
1942	120.1	123.6	123.4	127.5	127.5	121.1	127.2	123.7	130.8	129.3
1943	127.7	131.3	131.4	133.2	133.2	128.8	131.9	131.5	136.3	136.6
1944	137.1	139.4	139.5	139.4	139.7	139.0	137.1	138.4	142.4	142.8
1945	144.3	146.2	146.8	144.5	146.1	147.2	141.9	145.3	147.9	146.8
SEATTLE AREA										
1926–29	84.5	92.2	89.2	101.7	95.1	82.4	100.8	92.2	100.5	105.3
1939	96.7	104.4	103.8	119.2	114.9	94.4	115.1	108.3	118.7	125.9
1940	99.0	106.2	105.5	119.1	115.1	97.2	112.8	109.4	117.7	124.2
1941	109.9	115.1	114.5	123.0	119.9	109.7	118.8	116.1	123.3	128.7
1942	121.5	122.7	122.3	131.7	128.6	116.5	129.2	124.2	133.4	136.0
1943	125.4	129.7	129.2	136.6	134.1	124.4	133.7	130.8	138.9	142.1
1944	135.0	139.3	138.7	144.6	142.3	135.7	140.9	139.0	147.2	149.1
1945	143.7	148.6	148.2	151.7	150.5	143.6	147.0	148.7	154.5	156.8
WASHINGTON, D. C.										
1926–29	106.6	107.7	107.9	107.1	105.9	106.0	104.0	108.0	106.4	108.4
1944	140.5	139.4	139.3	134.8	134.2	143.5	127.8	134.9	134.9	135.0
1945	153.4	150.3	151.9	144.4	145.9	157.8	135.9	146.5	144.6	143.5

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See page 92, Apr. 27, 1939, issue for 1913-1938 data of series for Atlanta, New York, St. Louis and San Francisco.

Current indexes are calculated upon an actual survey at source of local construction cost conditions. Material prices used are those paid by contractors to material dealers. Labor rates are current rates paid by contractors—certain corrections being made in certain areas for labor efficiency and labor shortage. Index includes construction overhead, sales taxes, compensation insurance and social security. The indexes have been primarily engineered to use as local cost conversion factors to construction cost data released by the Boeckh organization. Complete index formula is available in published form in "Boeckh's Index Calculator Tables".

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THE RIC-WIL COMPANY · CLEVELAND, OHIO
AGENTS IN PRINCIPAL CITIES

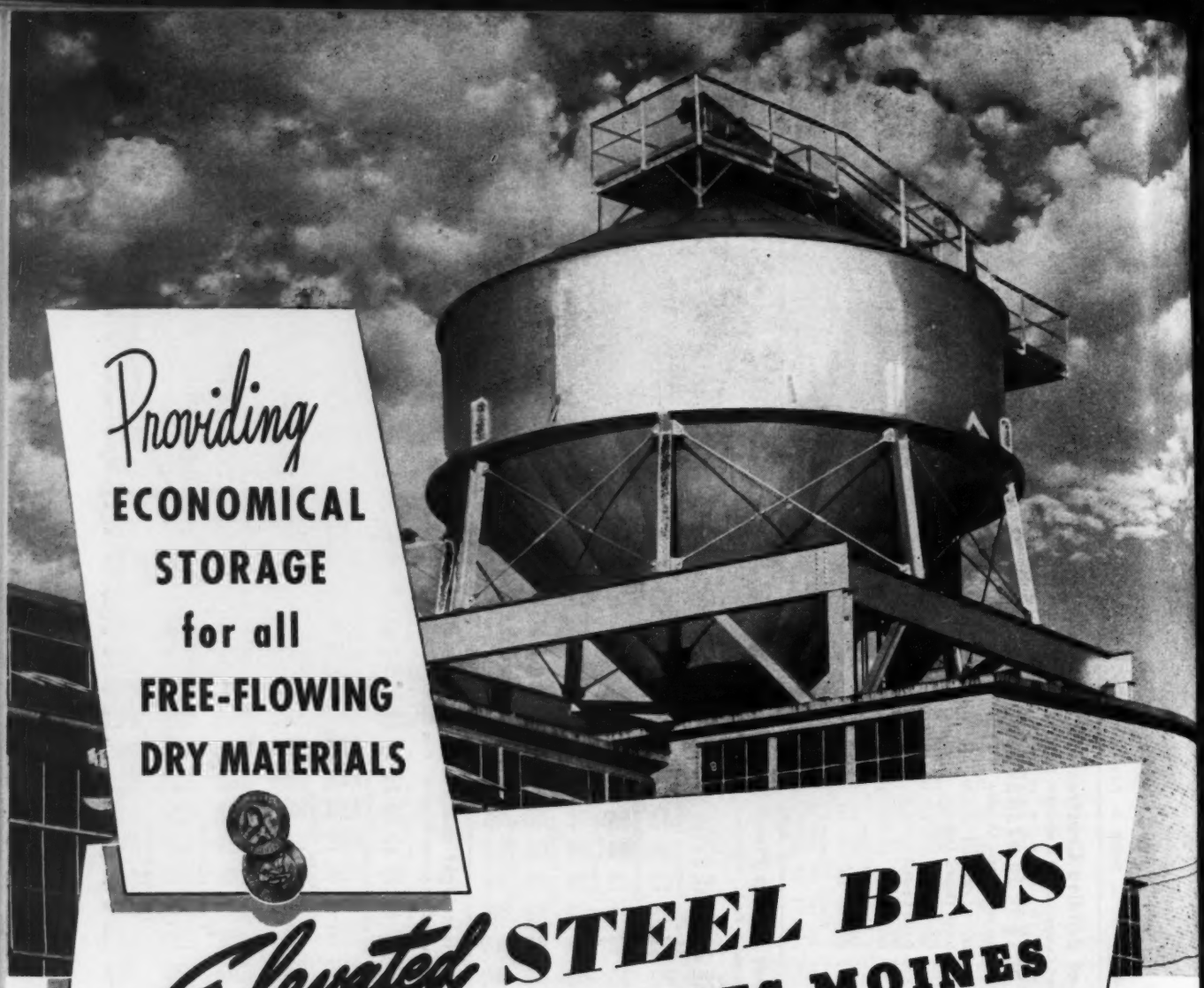
Public Utility Construction Cost Index

Compiled and published by Whitman, Requardt and Associates, and B. L. Smith & Associates, Baltimore, Md., for the Estate of William W. Handy

Table No. 1 · Cost Trends of Building Construction, 1911 to 1914 = 100

(Complete Index reports 13 items entering into Building Construction Costs.) A relates to Reinforced Concrete Bldg.; B relates to Brick Bldg.

	Jan. 1911	July 1911	Jan. 1912	July 1912	Jan. 1913	July 1913	Jan. 1914	July 1914	Jan. 1915	July 1915	Jan. 1916	July 1916	Jan. 1917	July 1917	Jan. 1918	July 1918	Jan. 1919	July 1919	Jan. 1920	July 1920	Jan. 1921	July 1921	Jan. 1922	July 1922	Jan. 1923	July 1923	Jan. 1924	July 1924	Jan. 1925	July 1925	Jan. 1926	July 1926	Jan. 1927	July 1927	Jan. 1928	July 1928	Jan. 1929	July 1929	Jan. 1930	July 1930	Jan. 1931	July 1931	Jan. 1932	July 1932	Jan. 1933	July 1933	Jan. 1934	July 1934	Jan. 1935	July 1935	Jan. 1936	July 1936	Jan. 1937	July 1937	Jan. 1938	July 1938	Jan. 1939	July 1939	Jan. 1940	July 1940	Jan. 1941	July 1941	Jan. 1942	July 1942	Jan. 1943	July 1943	Jan. 1944	July 1944	Jan. 1945	July 1945	Jan. 1946
Atlantic Seaboard Division																																																																																				
A.....	233	182	165	199	227	224	221	216	213	213	214	203	204	206	209	212	205	194	189	179	171	159	153	165	178	194	191	189	191	192	199	216	214	205	205	207	210	209	220	235	250	253	254	254	256	258	259	260	271																		



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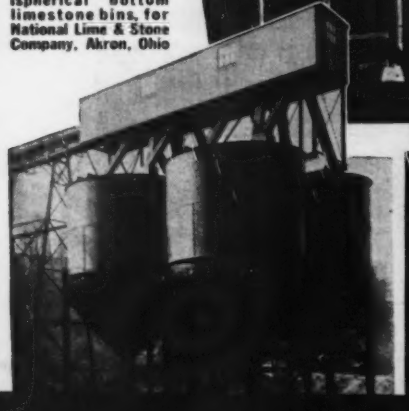
Two 28' diameter conical bottom coal bins, for Boys' Industrial School, Lancaster, O.

Four 22' diameter conispherical bottom limestone bins, for National Lime & Stone Company, Akron, Ohio



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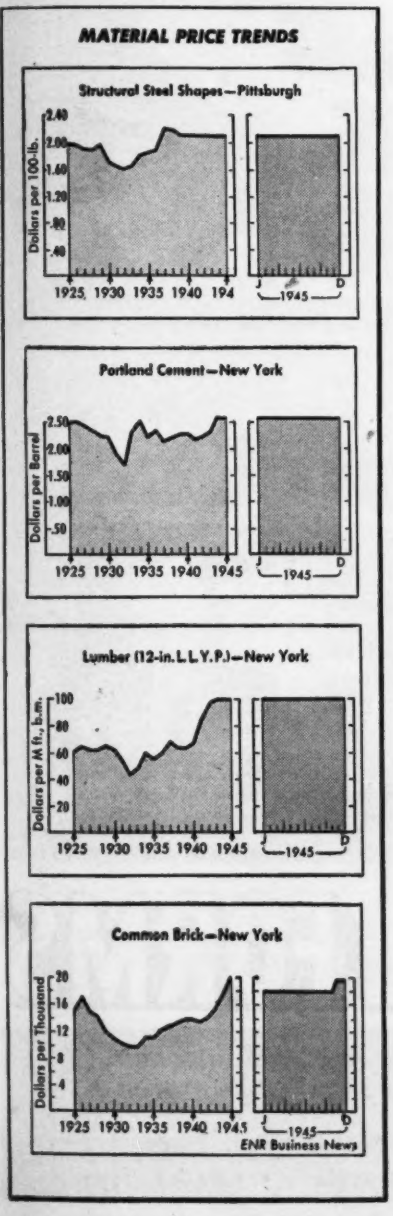
SEATTLE, 522 FIRST AVENUE, SOUTH

Prices of Construction Materials

CONSTRUCTION MATERIAL PRICES continued to rise in 1945 due largely to the OPA ceiling adjustments for certain materials in short supply including; structural clay tile, Southern lumber, cast iron soil pipe. Steel prices have remained steady but a rise in this material is anticipated. The combined index for all building materials for 1945 increased 36 percent over the 1939 average. The 66 percent increase in lumber prices for this period is chiefly responsible for the rise.



Basic Building Materials Prices

1874 to 1945 in New York City

Average yearly prices at New York, except in the case of steel, which is f. o. b. Pittsburgh mill; wrought, iron I beams for years 1879, 1885 and 1886. Brick, wholesale, f. o. b. Lime, common lump, wholesale, f. o. b., 180 lb., net, 1910–15, incl.; afterward, 280 lb. Cement, net, delivered; *Rosendale, 1874 to 1878, incl.*; afterward, Portland. Lumber, No. 1 com., rough, wholesale, at dock, for 1 in., yel. pine, 1874 to 1909, incl.; afterward, 3 in., long-leaf to 1913, incl. *LLYP–3 x 12 — from Lumber Trade Journal. †LLYP–12 x 12 as reported to Engineering News-Record. Cast iron pipe price per ton f. o. b. Delaware River foundries; *prices prior to 1901 are for all classes of bell and spigot;* prices subsequent to 1901 are for 6 in. and larger Cl. B or heavier bell and spigot; early prices from "Price History of Cast Iron Pipe" by United States Cast Iron Pipe and Foundry Co.; prices 1850, $35.72; 1855, $40.18; 1860, $32.15; 1865, $58.05; 1870, $50.

	Brick Common per M	Cement Per Bbl.	Lime Per Bbl.	Pine per M. Ft. b.m.		Steel Shapes, Per 100 Lb.	Cast Iron Pipe, Per Ton
1874	$7.41	*$1.45*	$1.50	$26.00		....	*$43.76*
1875	7.12	*1.25*	1.40	21.00		....	*37.51*
1876	5.87	*1.20*	1.00	21.00		....	*31.26*
1877	4.93	*1.10*	.80	20.00		....	*25.00*
1878	4.71	*.95*	.70	20.00		....	*23.22*
1879	4.08	2.70	.80	20.96		$2.78	*29.47*
1880	7.00	2.88	.87	19.00		....	*29.47*
1881	7.50	2.72	.95	19.00		....	*33.04*
1882	7.12	2.82	1.01	19.00		....	*35.68*
1883	8.28	2.75	1.05	19.00		....	*32.15*
1884	6.65	2.60	.95	19.00		....	*26.79*
1885	6.10	2.28	1.00	18.66		3.12	*25.00*
1886	7.51	2.28	1.00	19.00		3.00	*26.79*
1887	7.43	2.07	.82	19.00		....	*28.58*
1888	6.50	2.16	.83	16.75		....	*25.00*
1889	7.06	2.23	.92	20.31		....	*23.04*
1890	6.65	2.25	.95	21.75		....	*24.65*
1891	5.53	2.38	.87	18.00		....	*23.04*
1892	5.77	2.27	.93	18.50		....	*21.43*
1893	5.83	2.15	.93	18.50		....	*21.30*
1894	5.00	2.03	.85	18.50		1.20	*18.47*
1895	5.31	1.97	.78	16.92		1.35	*17.95*
1896	5.06	2.00	.69	16.42		1.60	*17.64*
1897	4.94	1.97	.72	16.44		1.24	*15.48*
1898	5.75	2.00	.70	15.75		1.27½	*15.48*
1899	5.69	2.05	.75	16.25		1.45	*21.17*
1900	5.25	2.16	.68	24.50		1.95	*22.33*
1901	5.77	1.89	.77	17.50		1.60	*21.63*
1902	5.39	1.95	.81	21.00		1.60	26.62
1903	5.91	2.03	.79	23.50		1.70	27.56
1904	7.50	1.67½	.80	21.50		1.60	22.92
1905	8.10	1.43	.89	24.92		1.62	26.54
1906	8.55	1.55	.95	29.33		1.60	30.12
1907	6.16	1.55	.95	30.50		1.75	31.52
1908	5.10	1.46	1.05	30.50		1.76	24.69
1909	6.39	1.41	1.05	33.04		1.50	24.19
1910	5.70	1.07	.75	24.00		1.46	22.99
1911	5.31	1.04	.75	24.63		1.36	19.99
1912	6.75	.97	.75	24.92		1.33	21.22
1913	6.75	1.18	.91½	* 25.04	†	1.50	21.96
1914	5.50	1.17½	.97	21.79	29.25	1.16	20.37
1915	5.50	1.00	.97	21.68	27.91	1.28	22.52
1916	8.00	1.32	1.50	27.60	31.58	2.45	30.25
1917	9.10	1.76	2.02	38.00	37.81	3.62	52.33
1918	10.98	2.48	2.16	46.68	43.33	3.00	58.68
1919	15.79	2.63	2.65	57.04	49.60	2.52	53.87
1920	18.00	3.52	3.15	71.17	66.50	2.45	71.77
1921	17.40	2.82	3.47	50.67	51.54	2.00	50.58
1922	16.91	2.43	2.79	49.41	51.83	1.70	46.42
1923	20.00	2.66	2.98	61.77	62.25	2.39	57.75
1924	18.00	2.50	2.88	55.17	59.00	2.19	54.33
1925	15.00	2.50	2.38	57.00	59.67	1.95	49.16
1926	17.00	2.50	2.18	60.33	62.17	1.93	48.50
1927	15.00	2.40	2.49	62.57	61.46	1.86	41.42
1928	14.00	2.30	2.30	63.33	61.34	1.87	35.92
1929	11.71	2.23	2.25	64.50	63.00	1.92	36.66
1930	10.88	2.19	2.25	64.33	60.64	1.71	37.00
1931	10.29	1.89	2.25	58.17	53.02	1.63	34.71
1932	9.75	1.62	2.25	39.91	41.33	1.56	30.58
1933	9.50	2.26	2.50	46.25	46.79	1.64	34.58
1934	10.87	2.48	2.50	57.17	58.92	1.78	41.00
1935	11.00	2.15	2.35	51.67	53.75	1.80	42.58
1936	12.00	2.26	2.80	56.75	57.75	1.84	43.00
1937	12.50	2.07	2.80	61.50	66.46	2.21	48.75
1938	13.10	2.12	2.80	59.33	62.75	2.18	48.33
1939	13.46	2.20	2.80	64.35	62.50	2.10	46.75
1940	13.50	2.20	2.68	67.39	65.46	2.10	49.00
1941	13.13	2.15	2.66	75.50	83.33	2.10	49.00
1942	14.17	2.20	2.80	85.61	98.33	2.10	49.00
1943	15.88	2.27	2.80	88.81	100.00	2.10	49.00
1944	17.46	2.42	2.80	89.92	100.00	2.10	49.00
1945	18.33	2.45	2.80	89.92	100.00	2.10	50.00

INDEX NUMBERS OF WHOLESALE PRICES—BUREAU OF LABOR STATISTICS

(1926 = 100)	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936
Building materials	117.7	115.5	111.4	110.2	103.2	94.8	90.5	90.3	95.2	86.7
Brick and tile	112.3	101.7	99.1	98.0	93.7	90.5	91.4	91.0	93.5	88.7
Cement	99.4	95.8	93.8	94.0	92.0	90.8	91.3	90.3	89.0	92.2
Lumber	154.9	152.7	141.3	133.0	122.5	102.9	93.2	87.4	99.7	87.0
Paint and paint materials	106.8	105.2	102.3	100.3	91.4	85.7	82.8	81.3	83.4	80.1
Plumbing and heating	93.4	92.2	90.7	95.4	84.8	80.4	79.2	78.5	78.8	75.0
Structural steel	107.3	107.3	107.3	107.3	107.3	107.3	107.3	111.0	113.2	95.0
Other building materials	104.3	103.1	102.0	103.5	98.3	93.3	90.3	92.7	99.1	90.2

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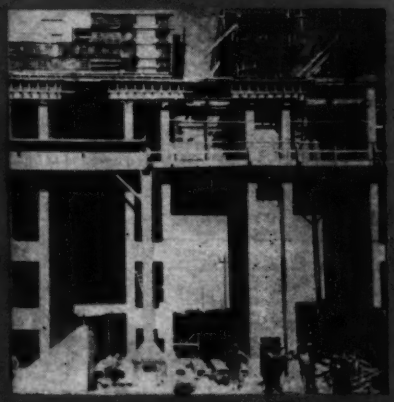

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MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

CONSTRUCTION MATERIAL and labor rates in April as reported to *Engineering News-Record* reveal several changes from the preceding month. The recent revision of steel prices by the OPA is reflected in April by eleven of the ENR cities recording price increases on this material ranging from $4.00 to $5.00 per ton; while a number of steel products are not yet assigned a definite price increase by the OPA, this is expected shortly. OPA increases for Douglas fir and yellow pine continue to be reflected in this month's ENR prices pages, but the lumber situation continues to be very tight throughout the country. Reports state that asphalt prices have increased; only New York City reflects a price increase in this material this month. Chicago, Minneapolis and New York all report increased prices this month for both fir and pine lumber. In Baltimore, structural clay tile price increased $5.00 per M. this month. In New York City ENR sources have stopped quoting prices for 8-10-12x12x12 structural clay tile-load bearing and have substituted 7⅝x7⅝x12 speedtile at $156.60 per M. pieces. Also noted is that the prices for structural clay tile products including speedtile in New York City are subject to increase not to exceed 15 percent of the prices quoted for shipments made by December 31, 1946 and thereafter, to prices in effect at the time of shipment.

Eight cities reported wage increases this month for both skilled and common labor. The result of the increases made to common labor during the past few months sends ENR common labor average over the $1.00 mark for the first time on record. Cincinnati, Cleveland and San Francisco increased wages for all construction men, skilled and common this month.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT (Per bbl., C/L lots, incl. 40c per bbl. for bags, cash dis not deducted)			SAND AND GRAVEL (Per ton, carload lots)			CRUSHED STONE (Per ton, carload lots)		CRUSHED SLAG (Per ton, carload lots, f.o.b. plant)		CONCRETE BLOCK (8x8x16-in.; truckload del.; per block)		CONCRETE (Ready Mixed 1:2:4, over 50 c.y., del.)
	Cloth [a]	Paper	Bulk	Gravel, 1½ in	Gravel, ¾ in	Sand	1½ in	¾ in.	1½ in.	¾ in	Sand-grav.	Lt wgt Agg.	per c.y.
Atlanta	$2.77	$2.52	$2.43	$1.79	$1.89	$1.65	$1.79	$1.89	$1.50	$1.69	$0.17	....	$8.30
Baltimore	2.62	2.37	2.12	1.80‡	1.80‡	1.30‡	1.80‡	1.80‡	1.75‡	1.75‡	.125	$0.125*w*	7.45
Birmingham	2.50	2.25	2.10	1.75	1.75	1.50	.85	1.00	.90	1.15	.1425	....	5.95
Boston	2.79*b*	2.72*b*	2.52	1.50‡	1.50‡	1.05‡	1.25‡	1.35‡	....	....	.13	.155*w*	7.55*m*
Chicago	2.90	2.65	2.50	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	.18	.18*x*	....
Cincinnati	2.51	2.26	2.06	1.20	1.20	1.10	1.80	1.80	....	....	.13	.17*w*	6.85
Cleveland	2.59	2.34	2.19	1.75*i*	1.75*i*	1.25/1.65*i*	1.80*i*	1.80*i*	1.15	1.15	.14	.14	8.15
Dallas	2.51	2.26	2.06	1.80*p*	1.80*p*	1.45*p*	1.72*p*	1.82*p*	....	....	.15	....	8.20
Denver	4.00	3.40	2.47	1.20	1.25	.90	1.65	1.75	1.00	1.00	....	.15	8.75
Detroit	2.59	2.34	2.16	1.75	1.75	1.55	2.25	2.25	2.00‡	2.00‡	.14	.15*w*	7.15
Kansas City	2.78	2.57	2.38	1.85	2.30	1.00	1.91	1.91	....	....	.16	.16*wy*	7.80*n*
Los Angeles	3.00*r*	2.40*r*	....	1.30	1.30	1.15	1.30*f*	1.30*f*	....	....	.04*bb*	.075*aa*	7.25
Minneapolis	3.10	2.85	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	.14	....	7.60*j*
Montreal	....	1.95*r*	1.79*r*	1.65‡*s*	1.65‡*s*	1.50*t*	.80*ct*	.90*ct*	....	....	.1999	.17*wt*	7.00*ls*
New Orleans	2.41	2.16	1.92	1.67	1.65	1.22	....	....	.90	1.15	.19	....	9.25
New York	2.85‡	2.60‡	....	1.60*de*	1.60*de*	.90*de*	1.80*de*	1.80*de*	....	....	.16	.14*wcc*	8.25*kq*
Philadelphia	2.73‡	2.48‡	2.28‡	1.55‡	1.65‡	1.20‡	1.90‡	1.95‡	1.10	1.10	.155	.155*w*	8.55
Pittsburgh	2.80	2.55	2.35	1.65‡	1.65‡	1.85‡	2.25‡	2.25‡	1.50	1.50	.17	.17*z*	8.55
St. Louis	3.08	2.80	....	1.75‡	1.75‡	1.65/1.75‡	1.25/2.00	1.25/2.00	.90*g*	1.15*g*	.155	.18*y*	8.60
San Francisco	2.21	2.01	1.71	1.36	1.36	1.36	1.46	1.46	....	....	....	.215*y*	7.55
Seattle	....	2.75*o*	....	2.35‡*t*	2.35‡*t*	2.35‡*t*	2.85‡*od*	2.85‡*od*	....	....	.16	....	7.25

‡ Delivered. *a* 10c allowed for each returnable bag. *b* 10c per bbl off for cash. *c* F.o.b quarry. *d* Per cu yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b Granite City, Ill. *h* F.o.b plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 2 percent for cash in 10 days. *l* 2000 lb. concrete. *m* 50c off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *q* 5 cu. yds. or more. *r* 10c per bbl off cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* Withdrawn. *v* 20c per bbl discount; 80c per bbl. for bags. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Pumice. *bb* 4 x 8 x 12 in. *cc* Also 8 x 18 x 18 in.

CASH DISCOUNTS CEMENT to Contractors, truck delivery 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c per bbl for payment within 15 days of date of invoice. Subject discount 10c per bbl 20 days in Montreal.

CURRENT MAXIMUM PRICE BASES AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c per bbl: 10c refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk
Buffington, Ind	$1.90	$1.85
Dallas, Tex	....	....
Hannibal, Mo	1.90	1.85
Hudson, N. Y.	....	....
Independence, Kans	1.90	1.85
Ironton, Ohio	$1.80*	$1.75*
Limedale, Ind	....	....
Norfolk, Va	....	....
Northampton, Pa	1.75	1.70
North Birmingham, Ala	....	....
Richard City, Tenn	$1.90	$1.85
Steelton, Minn	2.00	1.95
Universal, Pa	1.85	1.80
Waco, Tex. (Plus 9c tax in Tex.)	1.75	1.70
Montreal City (Discount 10c per bbl 20 days)	1.68	1.67

* Destination price base: effective Sept. 17, 1945.

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK: Granite per M lots of 50,000 4x4x8 in	Brick per M 3x4x8½ in carload lots	Wood per sq. yd. 3½ in 16-lb treat	PAVING ASPHALT (Per ton, less than 80 penetration): Tank car	Drums	ASPHALT BINDERS—FLUXES (Per gal., 80-300 penetration): Tank car	Drums	CUTBACK ASPHALT (Per ton): Tank car	Drums	ROAD OIL (Per gal.): Tank car	ASPHALT EMULSION (Quick-breaking, Per gal): Tank car	Drums
Atlanta	$73.00	.....	$2.25	.....	$14.00	$0.074	.....	$0.0806*h*	.....	$0.0781	$0.0805	.....
Baltimore	150.00‡	49.00	85.00*m*	15.00*r*	21.00*r*	.06*r*	0.09*r*	13.00*r*	23.00*r*	.06*r*	.07*r*	.14*r*
Birmingham	150.00	32.00*j*	.....	17.95	.....†	.0747	.....†	.0834*h*	.....†	.065	.095	.....†
Boston	85.00	59.00	3.75	15.00	24.00	.0625	.115	17.00	30.00	.0625	.0825	.145
Chicago	150.00‡	60.00*e*‡	2.85/4.00*d*	14.00	22.50	13.00*g*	21.50*g*	.0575*h*	.15*h*	.05*h*	.09/.10*n*	.13/.15*n*
Cincinnati	120.00	55.75	.....	17.00	.....	.085	.....	12.25	.....	.07	.085	.....
Cleveland	120.00	39.00	3.87	17.00	19.00	.085	.095	.10*h*	.11	.08	.10	.....
Dallas	.....	40.00	.....	13.65	20.30	.06	.11	16.00	24.80	.06	05/.07	.07/.09
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	37.00	.....	17.60*f*	26.56*f*	.0734	.128	.0718*h*	.119*h*	.067	.0974	.135
Kansas City	.....	44.00	.....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	.....	9.00*b*	23.00*b*	9.50*bg*	24.00*bg*	9.50*b*	.....	.025*b*	.072*b*	.15*b*
Minneapolis	.....	.....	2.017*d*	.....	27.70	.....	.126	.....	32.64	.....	.....	.....
Montreal	70.00	.....	.....	16.60*k*	24.25*k*	.1035*h*	.111*k*	.115*hk*	.135*hk*	.08*h*	.135*k*	.188*h*
New Orleans	.....	.....	.....	13.50*a*	20.00*a*	.057	.088	.06*h*	.095*h*	.....	.080	.....
New York	.....	65.00	.....	18.56	25.35	15.15	.....	.073*h*	.133*h*	.0675	.075	.1240
Philadelphia	150.00	62.00	4.06	15.00	.....	14.00/15.00	.....	.0625*h*	.....	.....	14.00*gr*	.....
Pittsburgh	135.00	39.75	3.75	18.00	23.00	.09	.16	20.00	36.00	.07	.08	.13
St. Louis	.....	40.00	.....	14.80	19.80	13.80*g*	18.80*g*	.0587*h*	.1362*h*	.483	.07	.1215
San Francisco	.....	45.00	.....	10.90	20.15	10.90*g*	.....	12.90	.....	.....	.0525	.1125
Seattle	.....	.....	.....	10.90*i*	21.90*i*	.....	20.40*gi*	11.40*i*	13.90	10.90	.0525*i*	.0625*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *d* 2-in interior block, 6-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3 x 3½ x 8½ in. *k* Tax included. *m* Per thousand. † Available on priority only and quoted specially. *p* No steel drum shipments except to armed forces. *r* February 1943 prices, none later available.

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton Standard	Light	Re-rolled	TRACK SUPPLIES Angle Bars	Std Spikes *e*	Tie Plates *e*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.90	....	$43.00	$45.00	$45.00	$2.70	$3.00	$2.15	$4.75
Chicago	2.10	2.35	3.75	3.25	$2.40	43.40	9.18	50.00*	2.85	3.65	....	4.75
Pittsburgh	2.35	2.35	3.75	3.25	2.40	43.40	9.18	9.18*	2.85	3.65	2.55	4.75
Buffalo	2.10	2.15	....	....	2.40	.....	.....	.....	....	....	2.30	....
Cleveland	2.10	2.15	3.75	2.90	....	.....	.....	.....	....	....	....	....
Youngstown	....	2.15	....	....	....	.....	.....	.....	....	3.25	....	....
Detroit	....	2.27‡	....	....	....	.....	.....	.....	....	....	....	....
Gulf ports	2.47*a*	2.52*a*	....	....	2.85*a*	.....	.....	.....	....	....	....	....
Pacific ports	2.75*a*	2.80*a*	....	3.40	2.95*a*	.....	.....	.....	....	....	....	....

‡ Delivered *a* F.o.b.cars dock *b* Rail steel same as billet prices *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per cl. * Per net ton

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb base price	REINFORCING BARS* Per 100 lb., ¼ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. ft., carload lots 4x16 in.. No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No 6 & 6 wires *k* Per 100 *e f*	SHEET PILING Per 100 lb base price
Atlanta	$2.34	$2.40	$2.40	$.02½	$.10	$21.06	$23.00	$1.82	$1.35	$1.91	$3.04
Baltimore	3.70	2.90	2.75	....	.10	23.00	25.00	1.70	1.27	1.79	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	1.89	....
Boston	4.162‡	4.194‡	....	$20 C.L.	.10	18.50	29.50	1.76	1.31	1.84	3.02
Chicago	2.35*a*	2.35*a*	2.35*a*	.03	.05	21.50‡	23.50	1.67	1.25	1.75	2.65
Cincinnati	3.68	2.66*cd*	2.66*cd*	....	.05	19.50	21.50	1.66	1.25	1.74	....
Cleveland	3.588*k*	3.10*k*	3.10*k*	.02½	.10	20.50	24.50	1.66	1.25	1.74	....
Dallas	4.25	3.17	3.17	....	....	25.50	27.50	1.93	1.42	2.03	....
Denver	4.577	4.34	4.25	....	....	28.00	.....	1.97	1.45	2.07	....
Detroit	3.911‡	2.70‡	2.70‡	....	.10	25.00	30.60	1.68	1.26	1.76	2.91
Kansas City	4.44	2.75*cd*	2.75*cd*	.0	.05	25.50	27.50	1.78	1.33	1.87	3.062
Los Angeles	4.45*f*	3.025	2.487	.02½	.05	23.00	27.50	1.93	1.42	2.03	4.45
Minneapolis	4.122‡	2.99	2.99	.0	.10	21.00	23.00	1.80	1.34	1.89	3.04*d*
Montreal	3.95*i*	2.90*i*	2.80*i*	....	....	31.00*hi*	46.00*hi*	2.76	3.44*i*	2.82*im*	....
New Orleans	4.408‡*k*	3.84*k*	4.108	.05	.10	22.00	24.00	1.82	1.35	1.91	3.125
New York	4.008	2.96*c*	2.96*c*	....	.15	17.50	19.50	1.72	1.29	1.81	2.74
Philadelphia	3.666	3.668	....	....	....	20.50‡	22.50‡	1.71	1.28	1.79	2.72
Pittsburgh	2.35*a*	2.35*a*	2.35*a*	.02½	.10	23.00	26.50	1.59	1.20	1.67	2.65
St. Louis	3.697	2.74	2.74	.0	.05	28.00	34.00	1.69	1.27	1.78	2.70
San Francisco	4.60	3.025	2.875	.02½	.10	21.00	24.50	1.93	1.42	2.03	3.20
Seattle	3.00*e*	3.00*e*	....	....	....	34.50	38.50	1.93	1.42	2.03	3.20*e*

‡ Delivered *a* Mill prices. *b* 5-15 tons, add 15c. 1-5 tons, add 25c. Less than 1 ton, add 50c *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. * High scrap steel prices cut former 15c differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *k* Quotation on changed basis; no actual price change. *m* Per sq. yd.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b 6 in to 24 in. *a*	VITRIFIED SEWER PIPE Per foot, std 8 in.. s.s.	Delivered std 12 in., s.s.	ASTM 24 in.	C13-35 36 in.	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in	CONCRETE SEWER PIPE Per ft., delivered; ASTM C 14-35 12 in.	24 in.	WROUGHT STEEL PIPE Full standard weight, *h* 1 to 3 in.. Butt Weld Black %	Galv %	3½ to 6 in.: Lap Weld Black %	Galv. %
Atlanta	$56.40	$0.43*b*	$0.67	$3.39	....	$110.00	$140.00	$0.45	$2.00	48.2	54.2	59.7	51.2
Baltimore	60.80	.35	.60	2.70	$7.25	160.00	200.00	.75	2.00	65.5	57.5	63.0	54.5
Birmingham	52.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.75	62.2	54.2	59.7	51.2
Boston	63.00	.392*r*	.756*r*	3.15*r*	7.995*r*	170.00‡*r*	265.00‡*r*	.46*i*	1.77*i*	....	....	....	....
Chicago	60.80	.40	.675	2.70	7.00	110.00‡	150.00‡	.45	1.85	63.0	52.0	61.5	50.0
Cincinnati	59.80	.308	.594	3.42	8.20	97.30	149.40	.36	1.60	57.1	43.4	54.0	39.6
Cleveland	61.20	.266*r*	.513	2.15	5.535	90.60	139.40	.36	1.60	68.5	57.5	66.0	54.5
Dallas	62.78	.365	.657	2.664	6.00	108.00	130.00	.46	1.57	....	....	....	....
Denver	67.62	.32	.576	2.376	....	143.00‡	264.00‡	.52	2.00	48	35	44	30
Detroit	61.20	.42	.81	3.15	8.50	170.00‡*r*	263.00‡*r*	.36	1.60	54.1	40.3	50.9	36.5
Kansas City	62.12	.35	.59	2.20	6.20	160.00	286.00	.45	1.60	37.88	48.40	48.70	61.93
Los Angeles	74.00	.325†	.585†	2.70	6.75	130.50	217.50	1.00†	2.00†	60.6	49.6	57.9	46.4
Minneapolis	64.10	.305†	.549†	2.196†	6.25†	....	....	.90	2.40	64.2	53.2	60.7	49.2
Montreal	67.00	.85*o*	1.50*o*	5.25*p*	8.50*rp*	45.00*m*	64.00*m*	.811*m*	2.51*m*	....	....	....	....
New Orleans	58.40	.37*r*	.78	1.60	....	150.00	220.00	.45	1.65	62.4	54.4	58.8	50.3
New York	60.20	.38	.75	3.06	7.88	....	....	.60	1.40	61.9	50.9	59.4	47.9
Philadelphia	58.90	.385	.75	3.06	8.00	180.00	250.00	.45	1.75	56.6	42.8	53.6	39.1
Pittsburgh	61.60	.287†*r*	.5535†*r*	2.475†*r*	6.4575*r*	124.20	193.80	.99	2.25*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*
St. Louis	59.40	.31	.558	2.232	4.95	93.50	187.00	1.00*j*	2.15*k*	68.5	57.5	66.0	54.5
San Francisco	74.00	.3875*d*	.6975*d*	2.79	6.975	124.50	207.50	.58	2.34	45.0	31.0	41.0	26.0
Seattle	75.80	.4125	.77	2.98	....	115.20	....	.51*f*	1.44*f*	....	....	....	....

‡ Delivered † F.o.b *a* B. & S. class B and heavier. C/L lots, Burlington, N. J. (base) $57.00 Based on existing freight rates; subject to rate change. Gas pipe and class A $3 per ton additional, 4 in., $5 per ton additional, 30 in. and larger usually $1 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¼ in., 8½c.; ⅜ in., 11½c.; 1 in., 17c.; 2 in. 37c.; 2½ in. 58½c.; 3 in. 76½c.; 4 in., $1.09; 6 in., $1.92; 3 per cent tax on transportation costs not included. *i* Applies also at Lorain, Ohio mills Chicago delivered base is 2½ points less on butt. 1½ on lap. Freight is figured from Pittsburgh Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base Butt-weld—1 in. and 1¼ in. black 34 galv 16; 1½ in. black 38 galv. 18½; 2 in. black 37½, galv 18. Lapweld—2½ in. to 3½ in. black 31½ galv 14½; 4½ in. to 8 in black, 32½ galv. 17. *j* Reinforced; spec. C 76-37. *k* Reinforced; spec. C 75-37 *m* Centri spun. *o* Less 50%. *p* Less 53%. *r* Truck delivery. *s* Price quotations on delivered basis since Mar. 1940; current FOB price $84 for 6in.; $130 for 18in. *t* Reinforced pipe prices since May, 1937; current plain pipe prices are: 12in., 36¢; 24in., $1.50. *u* Scarce; carload quantities not readily available.

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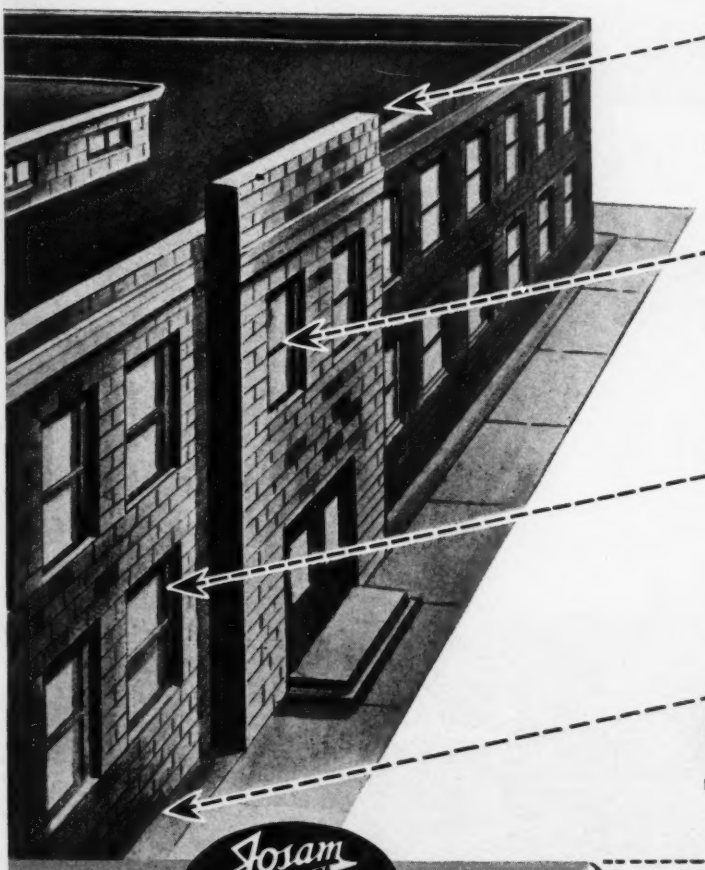
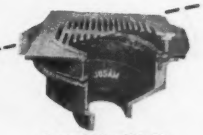
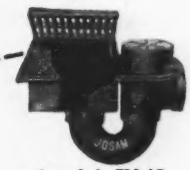


Josam Series 410-S
MAIN ROOF DRAIN



Josam Series 420-SP
PROMENADE ROOF DRAIN



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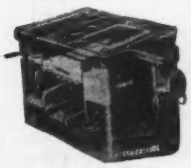
Josam Series 590-M
SWIMMING POOL DRAIN



Josam Series "J"
GREASE INTERCEPTOR

Josam Series 1170
BACKWATER SEWER VALVE

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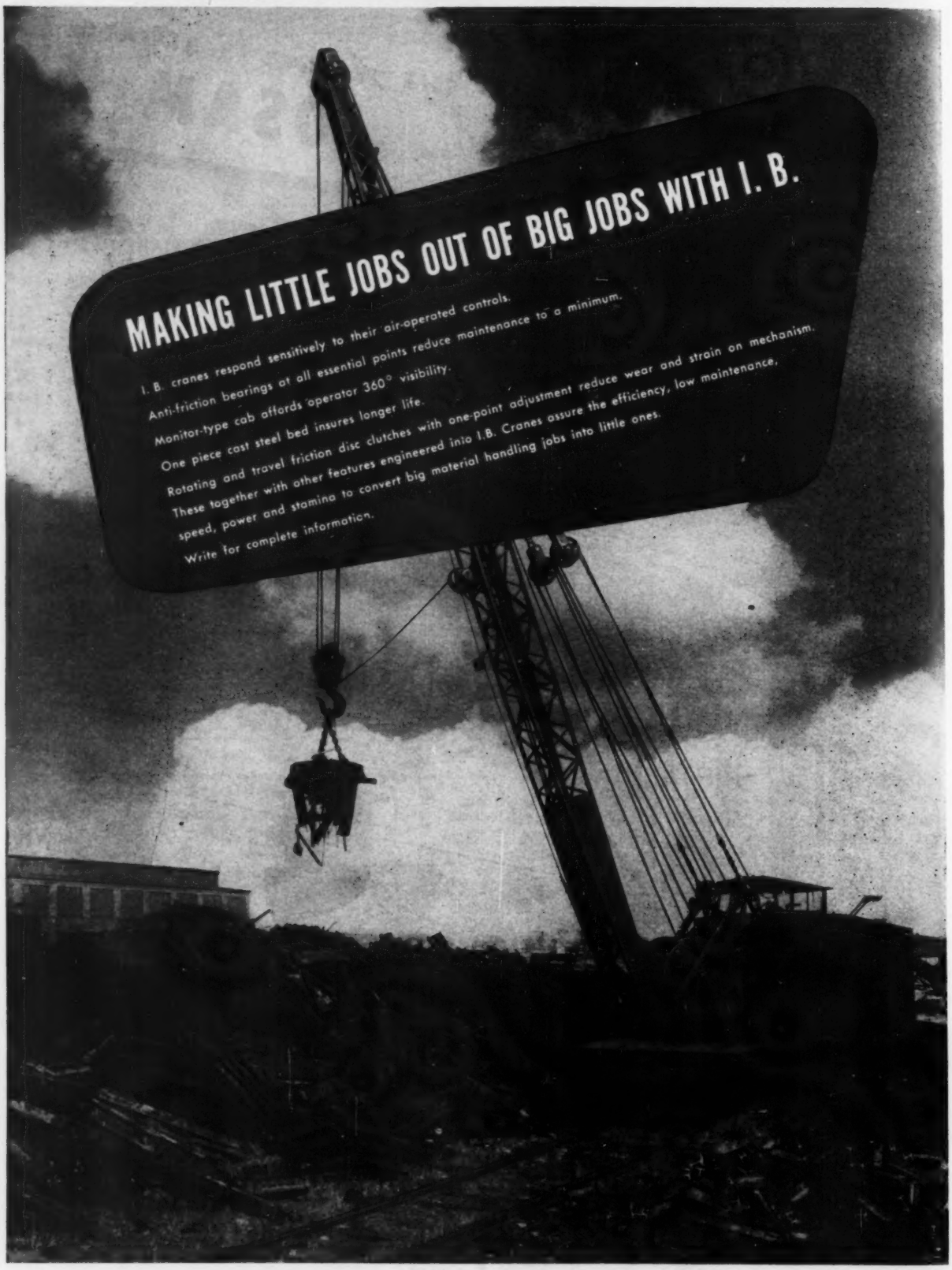
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LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) — *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*								LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 R2S	6x12 R2S	12x12 R2S	2x12 R2S	12x12 R2S	¼"	⅜"
Atlanta	$41.00	$41.00	$35.50	$38.50	$37.50	$41.50	$45.00	.....	.....	$60.50	$64.00	$17.90	$21.85
Baltimore	44.00	46.00	44.00	46.00	47.00	52.00	65.00	.....	.....	115.00	120.00	18.25	22.25
	48.00	*49.00*	*55.00*	*55.00*	*55.00*	*57.50*	*68.00*	*$75.00*	*$75.00*	.....	.....	.....	.....
Birmingham	45.00	45.00	44.50	43.50	44.50	47.50	68.00	55.00	56.00	.....	.....	17.35	21.15
[1]	50.00	50.00	49.50	48.50	49.50	52.50	72.00	.....	.....	67.50	70.00	.....	.....
Boston	60.00[1]	60.00[2]	60.00[2]	60.00[2]	60.00	62.00	66.00	.....	.....	58.00	58.00	18.25	22.25
	55.00	*55.00*	*54.00*	*54.00*	*54.00*	*54.00*	*58.00*	*58.00*	*58.00*	.....	.....	.....	.....
Chicago	55.00	55.00	58.50	54.00	54.00	60.00	68.00	.....	.....	80.00*l*	95.00*l*	14.60	17.80
	55.00	*55.00*	*54.00*	*54.00*	*54.00*	*55.00*	*56.00*	*56.00*	*57.00*	.....	.....	.....	.....
Cincinnati	47.50	49.00	42.50	42.50	42.50	44.50	67.00	.....	.....	65.00	65.00	17.35	21.15
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland	42.50*k*	42.50*k*	52.50*k*	51.00*k*	65.00	65.00	83.00	83.00	83.00	.....	.....	17.75	21.60
Dallas[e]	45.25	45.25	44.50	43.00	43.00	47.25	60.75	58.75	58.75	88.75	85.00	14.60	17.80
Denver[‡]	64.25[4]	64.25[4]	64.75[4]	65.25[4]	63.75[4]	64.75[4]	68.75[4]	*72.00*	*72.25*	.....	.....	10.45	12.70
Detroit	61.00	61.00	57.75	57.75	57.75	63.75	71.00	.....	.....	70.75	90.00	17.35	21.15
	57.00	*57.00*	*57.00*	*57.00*	*62.75*	*72.75*	*75.00*	*75.00*	*90.00*	.....	.....	.....	.....
Kansas City[a]	69.00	69.00	67.00	65.50	67.00	69.00	84.00	.....	.....	84.00	94.00	12.60	15.40
	66.00	*66.00*	*59.50*	*59.50*	*59.50*	*59.50*	*75.00*	*80.00*	*80.00*	.....	.....	.....	.....
Los Angeles[a]	*60.00*	*60.00*	*60.50*	*60.75*	*59.25*	*59.25*	*72.75*	*72.00*	*72.00*	.....	.....	9.90*gh*	12.05*gh*
Minneapolis[‡b]	63.00[4]	62.00[4]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.60	15.40
[‡]	*69.00*	*69.00*	*60.00*	*61.00*	*59.00*	*60.00*	*61.00*	*65.00*	*65.00*	.....	.....	.....	.....
Montreal	*64.00*	*65.00*	*60.00*	*63.00*	*65.00*	*70.00*	.....	.....	.....	200.00	200.00	.....	.....
[†7]	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*80.00*	*80.00*	*80.00*	.....	.....	.....	.....
New Orleans	41.00	39.50	37.00	35.00	34.00	36.00	46.00	.....	.....	55.00	69.00	14.60	17.80
	30.50	*30.50*	*30.00*	*30.00*	*29.00*	*29.00*	*28.50*	*29.50*	*29.50*	.....	.....	.....	.....
New York	67.50	67.50	62.50	62.50	62.50	64.00	74.00	.....	.....	120.00*f*	125.00*f*	18.35	22.25
[‡]	.....	.....	*65.00i*	*65.00i*	*65.00i*	*65.00i*	[Range from $75 to $95]			.....	.....	.....	.....
Philadelphia	75.00	75.00	75.00	75.00	75.00	75.00	75.00	.....	.....	130.00	130.00	18.25	22.25
	75.00	*75.00*	*75.00*	*75.00*	*75.00*	*75.00*	*85.00*	*90.00*	*90.00*	.....	.....	.....	.....
Pittsburgh	50.80	53.20	62.75	55.00	60.85	62.50	76.25	.....	.....	.....	.....	18.10	22.05
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*82.75*	*88.75*	*88.75*	.....	.....	.....	.....
St. Louis[‡e]	61.00	61.00	57.00	56.00	57.00	59.00	71.00	*75.00*	*75.00*	87.00	87.00	14.60	17.80
San Francisco[d]	*41.00*	*41.00*	*36.50*	*36.75*	*35.75*	*35.75*	*37.50*	*36.00*	*36.00*	.....	.....	7.30*g*	8.90*g*
Seattle	*45.50*	*45.50*	*45.75*	*45.75*	*44.50*	*44.50*	*47.75*	*47.75*	*46.50*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Spruce. [‡] Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface-Seattle base price on ¼", $95.15; on ¾", $104.85; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* Ranges from $65 to $75. *k* August 1943 price. *l* September price; none later available.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*	
Atlanta	74%	75%	$0.15	
Baltimore	78%	79%	.15	
Birmingham	76%	76%	.105	
Boston	77%	78%	.15	
Chicago	77%	77%	.15	
Cincinnati	77-10%	77-10%	.15	
Cleveland	77%	77%	.19	
Dallas	76%	76%	.1625	
Denver	76%	76%	.155*e*	
Detroit	77%	77%	.1575	
Kansas City	77-10%	77-10%	.155	
Los Angeles	86%*d*	88%*d*	.1575	
Minneapolis	77%	77%	.155	
Montreal	40-10-2%*ab*	50-2%*ac*	.1675†	
New Orleans	70%	75%	.16	
New York	81%	82%	.22*f*	
Philadelphia	78%	79%	.15	
Pittsburgh	79%	79%	.1225	
St. Louis	77-10%	77-10%	.155	
San Francisco	66%	73%	.155	
Seattle	75%	75%	.1575†	

Price of 60% Ammonia Gelatin is $0.01 per lb higher than 40%

a Discount from list Sept. 1939; sales tax included, but 6% tax exemption not allowed for. *b* Single thickness. *c* Double thickness. *d* Discount from jobbers' list Sept. 15, 1928.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal St. add delivery charge of $6.00 per trip.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine.	.11 -.1175	.135 -.1475	.155 -.1675
Rocky Mtn. States	.11 -.1225	.135 -.1525‡	.155 -.1725‡
Pacific N. W. States	.1075-.12	.1375-.15	.1575-.17
Pacific S. W. States	.1050-.1125	.135 -.1425	.155 -.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES TIES— F.O.B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail — Pine*	Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.34	.....
12 in.— 2 ft. from butt	6-in.	50 to 59-ft.	.35	.....
12-in.— 2 ft. from butt	6-in.	60 to 69-ft.	.36	.....
12-in.— 2 ft. from butt	6-in.	90 to 100-ft.	....	.5325
13-in.— 3-ft. from butt	5-in.	91 to 100-ft.	....	.5725
14-in.— 2-ft. from butt	6-in.	50 to 69-ft.	.41	.6275
14-in.— 2-ft. from butt	6-in.	70 to 79-ft.	.43	.57
14-in.— 2-ft. from butt	5-in.	80 to 85-ft.	.54	.....
14-in.— 2-ft. from butt	5-in.	85 to 89-ft.	.57	.....
14-in.— 2-ft. from butt	5-in.	90 to 100-ft.	....	.62

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

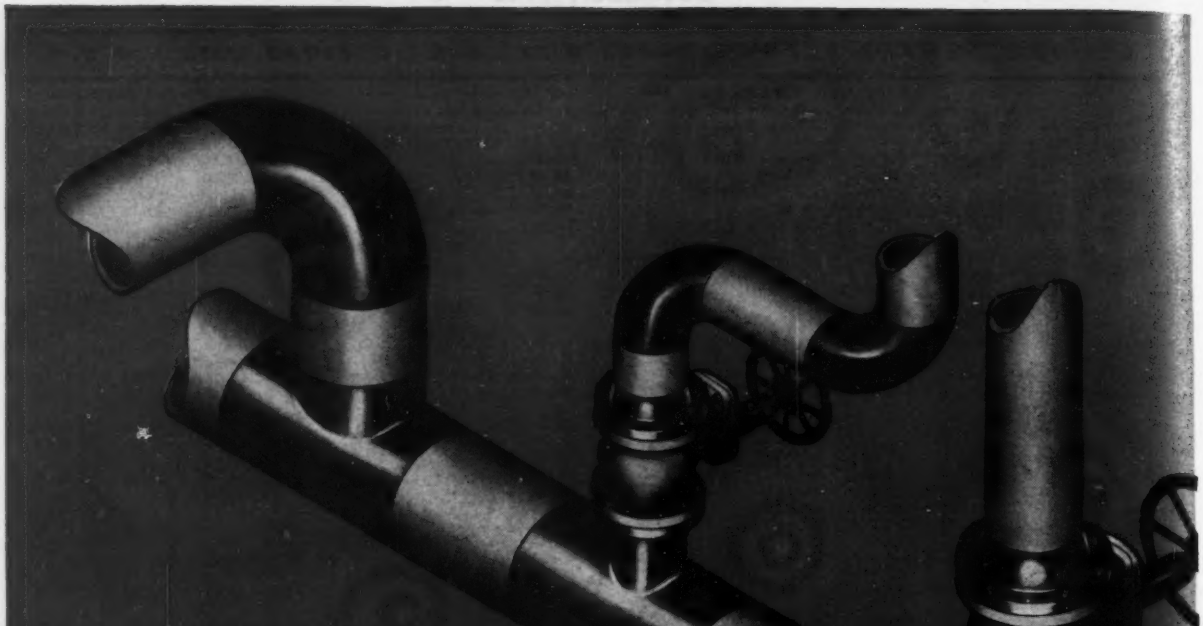
Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.50	....	$2.00	....
	Pine	2.00	$3.00*a*	2.50	$3.00*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	White Oak	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.45/2.65*a*	....	3.35/3.60
Los Angeles	Douglas Fir	2.00	3.25*a*	2.90	4.70*a*
Philadelphia	Red Oak	....	2.10*ag*	....	3.25*ag*
St. Louis	White Oak	1.60	....	2.19	....
	Red Oak	1.63	2.15*a*	2.19	3.25*a*
	Sap Pine or Cypress	1.70	....	2.06	....
San Francisco	Douglas Fir	1.25*bef*	....	....	3.00*caf*
Montreal	Birch or Maple	....	1.65	1.04	....

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6"x8"x8'6". *c* Empty cell. *e* Green. *f* F.o.b. cars. *g* January 1943 price, none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.50- 3.10
Chlorine cylinders, liquid, per lb., delivered	.0525
Calcium chloride, 77-80%, flaked, 100-lb. paper bag, del'd, ton.	18.50-35.00
Silicate of soda, 52 deg. in drums, f.o.b. works, per 100 lb.	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb	5.00



DIMENSIONAL ACCURACY with TUBE-TURN WELDING FITTINGS

WHEN pipe and fittings agree in O.D., I.D. and wall thickness, alignment from the *outside* brings them into perfect alignment on the *inside* also. The dimensional accuracy of Tube-Turn welding fittings permits installing any pipe line according to design without making allowances for variations in individual fittings.

All Tube-Turn fittings of the same part number are identical in all dimensions. Quality-controlled Tube-Turn fittings incorporate uniform wall thickness, smooth inner wall and close-knit grain structure. This complete line is available in sizes ranging from one-half inch to 30 inches to meet all your fittings requirements.

Consult your favorite piping authority and see your Tube Turns distributor. For more information on the superiority of Tube Turns' exclusive manufacturing methods and data on successful installations in many industries, write for Catalog 111.

• • •

Selected Tube Turns Distributors in every principal city are ready to serve you from their complete stocks.

TUBE TURNS (Inc.), Louisville 1, Kentucky. Branch Offices: New York, Washington, D. C., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Houston, San Francisco, Seattle, Los Angeles.

TUBE-TURN TRADE MARK **tt** *Welding Fittings and Flanges*

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M lots of 2,000 pieces or over,			BRICK Per M in quantity		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized, or lump
Atlanta	$104.00	$114.00	$199.00	$234.00	$244.00	$250.00	$18.25	$20.04	$26.54	$15.04	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	300.00	17.00k	21.00k	19.00	14.00	2.50m
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	16.50	23.00	18.11	13.64	2.25o
Boston	103.75a	110.65a	207.45a	248.90	.....	.....	20.00i	20.00i	21.00†	.....	16.00
Chicago	85.80	91.70	172.60	x	x	x	17.00	18.00	17.00	15.00	12.50
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	27.75	27.75	15.50	13.00	.....
Cleveland	97.50	104.00	x	.....	.....	.....	22.75	22.75	15.75	13.25	.....
Dallas	71.40	76.40	145.30	183.50	238.00	294.50	15.25i	16.75i	19.00	15.00	15.00
Denver	99.00	112.00	185.00	214.00	248.00	294.00	21.50	18.00	25.00j	17.00j	20.00j
Detroit	92.70	96.70	174.50	198.80	257.20	294.30	23.25	23.25	18.00	16.00	16.00
Kansas City	67.00	69.00	89.00c	128.00	163.00	189.00	17.50	18.50	19.32	13.00	10.92
Los Angeles	73.50†r	89.50†r	128.00c†r	210.00†r	368.00†r	460.00†r	13.50	15.00	16.50	17.50	17.50
Minneapolis	111.60b	111.60b	186.25b	.....	189.00b	262.00b	25.50	31.50g	21.00	16.00	19.00
Montreal	92.50a	98.50a	196.25a	151.50a	100.50at	134.50at	22.16†u	33.20†u	24.60u	15.00u	14.00u
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	99.40	106.00	145.75c	235.00h	287.40h	355.80h	19.50/20.50	.....	20.00	14.00	17.00
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	20.75	23.75	19.00	16.00	15.00
Pittsburgh	87.20	91.20	169.80	252.00	284.00	325.00	23.25	25.25	17.90	15.40	2.55m
St. Louis	67.00	72.00	130.00	190.00	244.00	290.00†	22.50	21.50	22.00	18.00	2.50m
San Francisco	96.00	108.00	144.00	108.00t	.....	.. ...	22.50	.....	24.00	23.00	2.50m
Seattle	115.00	125.00	230.00	.....	.....	.....	20.50/f	24.00/f	20.00s	20.00s	3.00m

† F.o.b. a Smooth. b Carload lots delivered to job. c 6x12x12 in., 3-cell. d Not load bearing. f Less $1.00, ½ cash 15 days, bal. 30 days. h F.o.b. Perth Amboy, N. J. i F.o.b. Warehouse only. j LCL. k $1.00 discount if paid in 10 days. l Lump. m Per bbl., 180 lb. o Per bbl., 200 lb. p 280 lb. bag. r 5% discount 10 days. s 2% discount for cash. t 5½x8x12. u 8% sales tax included. v 6x12x12-in. x Not available.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

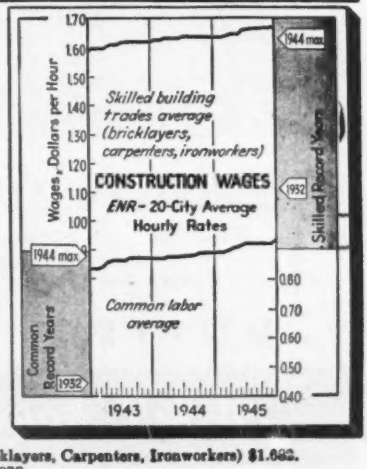
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl Dry a	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite b	Aluminum c	Ferric Oxide d	ROOFING SUPPLIES Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Carload lots f.o.b. factory Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$1.85	$1.72	$1.72	$0.305	$27.00
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40	29.00
Birmingham	10.25	14.125	2.35	3.50r	1.98r	2.09	1.98	1.98	.32	28.35
Boston	10.00	13.75	1.75	2.50	2.31	2.00‡h	3.30‡us	3.30‡us	.25‡	21.00‡
Chicago	10.00	13.75	....	....	....	1.75h/	1.74h/	1.82h/	.33/	23.00/
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.20	2.10h	2.10h	.33	25.00
Cleveland	10.00	13.75	1.70	2.90	1.60	1.71	1.63h	1.61h	.237	25.00
Dallas	10.00	14.50	1.88	2.11n	.05l	1.75h	1.66h	1.66h	.35	39.00
Denver	10.00	14.25	....	....	.27l	2.45	2.95	2.95	.35	28.00
Detroit	10.00	13.75	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	10.00	13.875	2.30g	2.55gr	2.16g	2.19	2.30	2.30	.28	27.50
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	10.00	13.875	....	....	....	1.7123i	1.6243h‡i	1.6243h‡i	.32	23.00
Montreal	.....	11.05	2.50p	4.90p	3.15p	4.02t	2.58t	3.01t	.19t	2.10hl
New York	10.00	13.75	2.03	....r	1.82	1.7098	1.6273a	1.6273a	.26	23.00
Philadelphia	10.00	13.75	1.60/1.80	2.20r	1.55	2.25	2.71	2.71	.32	23.00
Pittsburgh	10.00	13.75	1.05	1.95	.80	1.95	1.84h	1.84h	.34	26.00
St. Loui	10.00	13.75	2.28s	2.89s	1.96s	1.77	1.77	1.77	.35	23.00
San Francisco	10.25	14.00	1.80	2.75n	1.35	1.71	2.40	2.40	.33	20.50
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16h	....	.35	26.50j

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. a Red lead prices change frequently due to pig lead price changes. b U. S. War Dept. Spec. 3-49A. c ASTM Spec. D266-31. d 80% minimum ferric oxide. f Distributors' price to contractors. g 5 gal. can. h Per roll, 65 lb. i Minneapolis and vicinity. j Asphalt pitch. k Per 100 lb. l Per lb. n May, 1941 price. o 60-lb. roll. p Plus 8% sales tax. r Not available, except on priority rating; then quoted specially. s December, 1942 price. t Federal tax included. u 90-lb. roll. v Truck delivery.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.50	$1.25	$1.50	$1.25	$1.50	$0.40	$0.50
Baltimore	1.75	1.675	1.80	1.625/1.80	1.725	.95	.95
Birmingham	1.75	1.375	1.625	1.50	1.65	.65	.65
Boston	1.625	1.50	1.675	1.50 /1.875	1.667	1.00	1.00
Chicago	1.90	1.85	1.88	1.85	1.90	1.20	1.20
Cincinnati	1.825	1.60	1.725	1.45 /1.60	1.75	.90	.90
Cleveland	1.875c	1.65	1.875	1.875	1.875	1.085	1.125/1.155
Dallas	1.625	1.25	1.50	1.75	1.625	.60	.75 /1.25
Denver	1.80b	1.625	1.50b	1.50 /1.625b	1.65	1.00	1.00
Detroit	1.725	1.50	1.825	1.675/1.825	1.775	1.00	1.00
Kansas City	1.75	1.575	1.70	1.70	1.75	.975	.90
Los Angeles	1.50	1.35	1.625	1.375	1.667	.875	.875
Minneapolis	1.625	1.50	1.625	1.60	1.725	.95	.95
New Orleans	1.625	1.375	1.625	1.55	1.50	.70	.80
New York	2.00b	1.855	2.00	2.00b	2.00b	1.10	1.10
Philadelphia	2.00	1.58	1.90/2.00	2.25	2.00	.90	.90
Pittsburgh	1.90	1.75	1.75	1.8125	1.875	1.00	.90
St. Louis	1.90	1.70	1.90	2.00	1.75	1.00	1.00
San Francisco	1.875	1.50	1.75	1.50/1.75	1.75	1.00	1.00
Seattle	1.845	1.545	1.745	2.00	1.845	1.145	1.145
Montreal*	1.06	.96	1.01	1.01	1.05	.61	.66

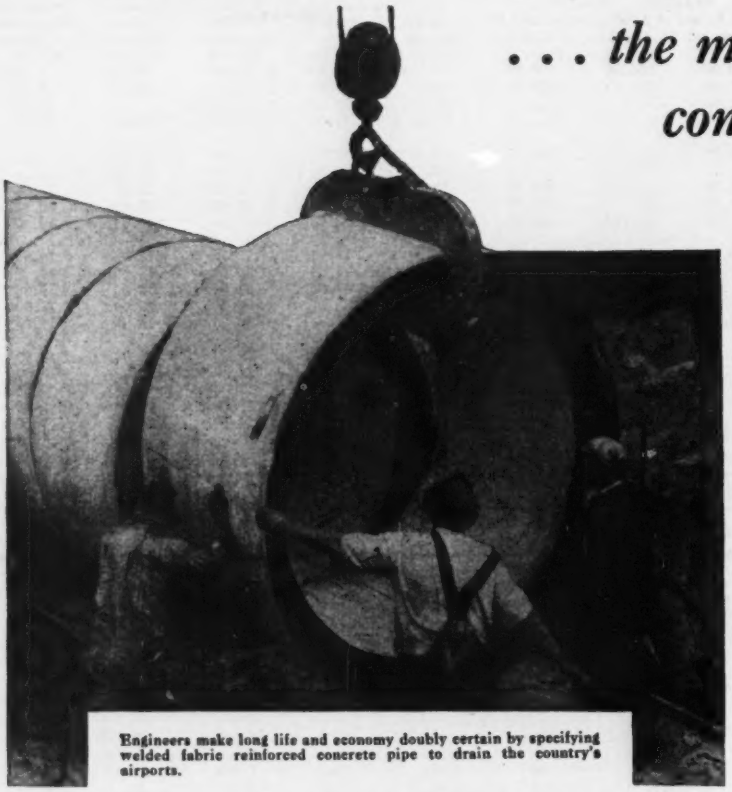
b 7 hr. day. c Prevailing rate on government work. * Cost of living bonus now included in basic wage.



ENR Skilled Average; (Bricklayers, Carpenters, Ironworkers) $1.682.
ENR Common Average; $0.938.

FOR AIRPORT RUNWAYS, ROADS AND CONCRETE PIPE

. . . *the most widely used concrete reinforcement*



Engineers make long life and economy doubly certain by specifying welded fabric reinforced concrete pipe to drain the country's airports.

Welded Wire Fabric, with its closely spaced small members of high yield point cold drawn steel, provides positive crack control in the concrete pavement slab.

THE QUALITIES which induced engineers and contractors to specify and use U·S·S AMERICAN Welded Wire Fabric reinforcement on many of the nation's airports have been proved during years of satisfactory service on the country's concrete highways.

Made of cold drawn steel, prefabricated by electric welding, American Welded Wire Fabric provides crack control through the superior reinforcing value of closely spaced high yield point steel wires. It gives the concrete slabs strength to resist shocks and strains in all directions. Should cracks appear, the welded wire fabric holds the faces of the crack tightly together and prevents rapid disintegration of the concrete.

Other advantages? Engineers and contractors can tell you that with American Welded Wire Fabric you use less steel (because of its close distribution of high strength members), reduce construction time and cost; that it is easily handled, quickly installed, lies flat and always stays in place.

When you are planning peacetime structures and highways, plan to give them the extra strength and durability which assure extra years of useful service. That has been done on existing reinforced concrete construction by billions of square feet of U·S·S American Welded Wire Fabric.

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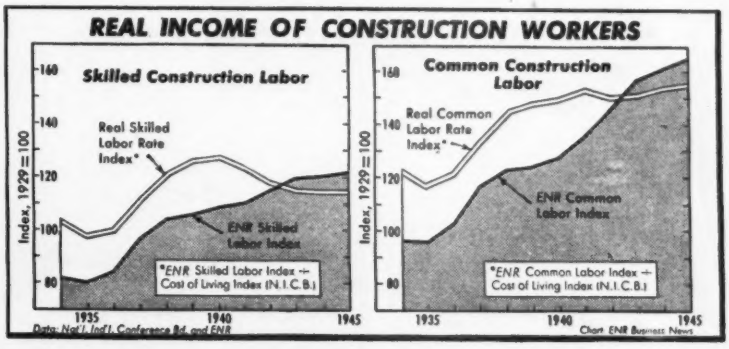
Construction Wage Rates and Trends

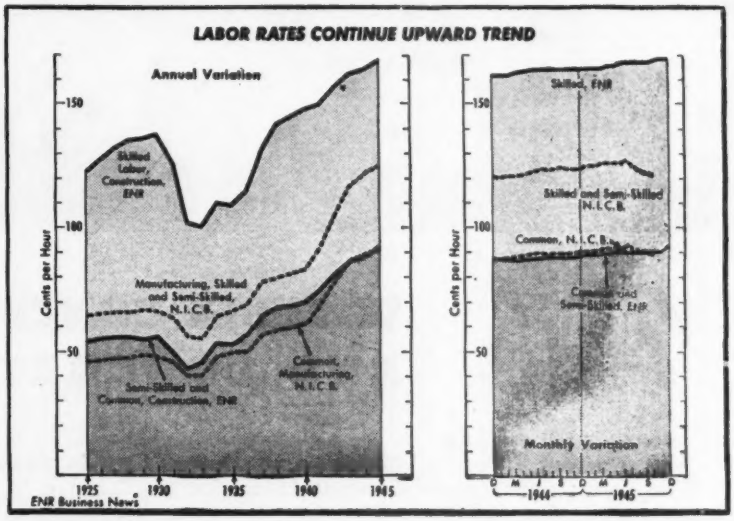
Common labor hourly rates for construction workers averaged 91.0¢ per hour in 1945, a record high, and 3.5 percent higher than the 1944 *ENR* 20-cities average. The common average in January 1945 was 89.1¢ and rose to December high of 93.8¢.

The skilled construction hourly rate of *ENR* 20-cities average was $1.64 in January 1945 and rose to $1.68 in December for a year's average of $1.66, 2 per cent above 1944's average and the highest *ENR* average reported.

The sudden end of the war in August, saw common and skilled labor in 26 manufacturing industries drop in hourly earnings due to the decline in overtime and bonuses. Unskilled labor earnings, 93.1¢ in June 1945 averaged 91.6¢ for the year, while skilled and semi-skilled labor, $1.268 in June averaged $1.252 for the year, according to ten-month statistics of N.I.C.B.

The real income of skilled construction workers, which takes into consideration changes in cost of living, dropped slightly in 1945 below 1944. The skilled labor index rose 2 points during the year and the cost of living rose 1.8 points. The rise of 5 points in the common labor index more than offset the 1.8 point increase in the living cost reported by N.I.C.B.


REAL INCOME OF CONSTRUCTION WORKERS
Skilled Construction Labor
Common Construction Labor
Index, 1929 = 100
Real Skilled Labor Rate Index*
Real Common Labor Rate Index*
ENR Skilled Labor Index
ENR Common Labor Index
*ENR Skilled Labor Index ÷ Cost of Living Index (N.I.C.B.)
*ENR Common Labor Index ÷ Cost of Living Index (N.I.C.B.)
1935
1940
1945
Data: Nat'l. Ind'l. Conference Bd. and ENR
Chart: ENR Business News



Construction Wages—Rates per Hour

20-CITIES AVERAGE REPORTED BY ENGINEERING NEWS-RECORD

CONSTRUCTION WAGES

	Skilled Aver.†	Common
1910	$0.525	$0.179
1911	.534	.179
1912	.542	.182
1913	.555	.19
1914	.565	.177
1915	.57	.182
1916	.58	.192
1917	.61	.281
1918	.68	.38
1919	.78	.466
1920	1.05	.579
1921	1.06	.54
1922	1.01	.442
1923	1.10	.518
1924	1.19	.555
1925	1.22	.538

Notes:

†*ENR* Skilled Average represents rates for bricklayers, carpenters, ironworkers.

(1) Skilled and Semi-skilled.

(2) Unskilled.

Both represent earnings per hour as reported by N. I. C. B.

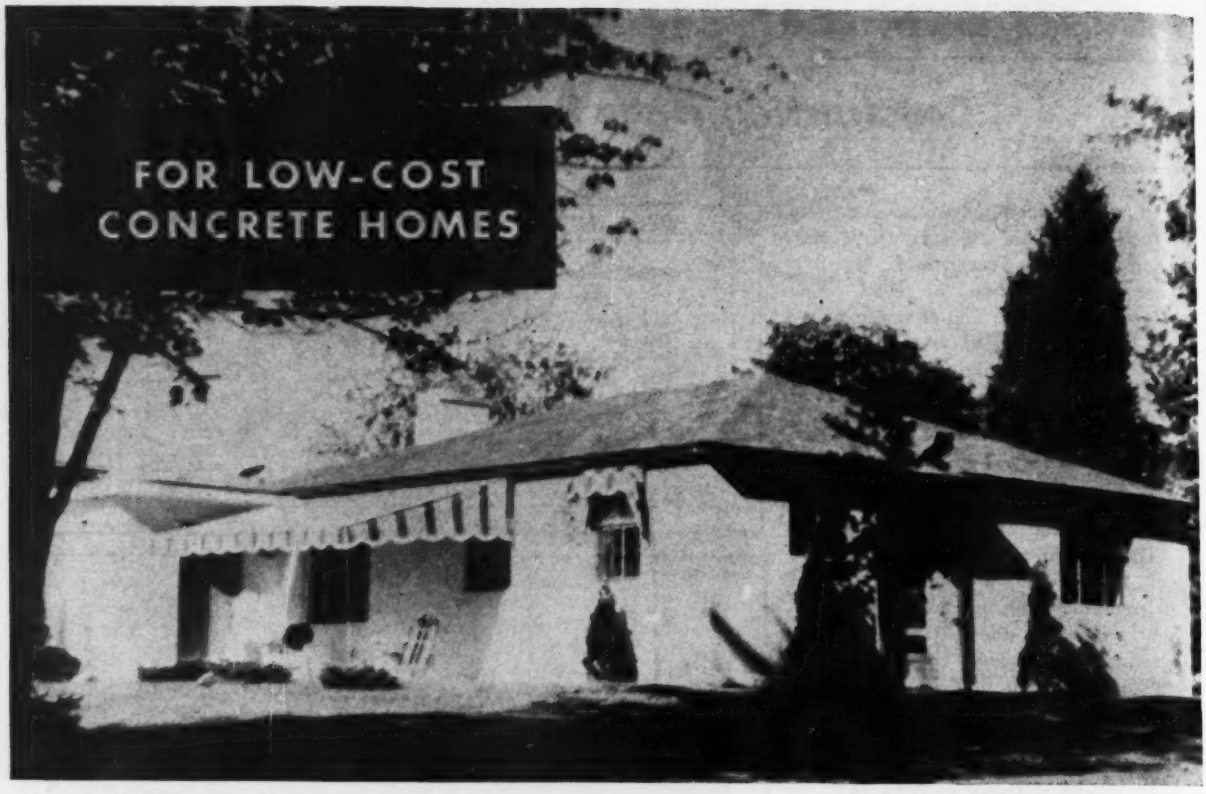
*Checked monthly. Reported in first issue of *ENR* each month.

SKILLED LABOR †* (Dollars per Hour)

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
J	$1.24	$1.28	$1.34	$1.35	$1.37	$1.37	$1.15	$0.989	$1.054	$1.108	$1.119	$1.22	$1.39	$1.43	$1.47	$1.47	$1.53	$1.61	$1.62	$1.64	$1.70
F	1.24	1.32	1.34	1.35	1.38	1.37	1.11	.996	1.062	1.104	1.119	1.24	1.39	1.43	1.47	1.47	1.54	1.61	1.62	1.64	1.73
M	1.24	1.32	1.34	1.35	1.38	1.36	1.11	.991	1.069	1.092	1.132	1.25	1.40	1.43	1.47	1.47	1.54	1.61	1.62	1.64	1.74
A	1.25	1.30	1.35	1.35	1.38	1.36	.95	.997	1.084	1.093	1.134	1.26	1.40	1.44	1.47	1.48	1.54	1.61	1.63	1.65	1.76
M	1.26	1.31	1.36	1.35	1.38	1.36	.96	.998	1.101	1.081	1.138	1.30	1.40	1.44	1.47	1.49	1.54	1.61	1.63	1.65	....
J	1.27	1.33	1.35	1.36	1.38	1.32	.99	.994	1.101	1.074	1.138	1.33	1.41	1.44	1.47	1.49	1.55	1.61	1.64	1.66	....
J	1.27	1.33	1.35	1.36	1.38	1.23	1.00	.985	1.104	1.077	1.159	1.35	1.43	1.44	1.48	1.50	1.56	1.62	1.64	1.66	....
A	1.28	1.34	1.35	1.37	1.39	1.19	.98	.986	1.110	1.088	1.159	1.37	1.43	1.44	1.48	1.50	1.59	1.62	1.64	1.67	....
S	1.28	1.34	1.35	1.37	1.39	1.19	.99	1.016	1.119	1.088	1.159	1.37	1.43	1.44	1.48	1.52	1.59	1.63	1.64	1.67	....
O	1.29	1.33	1.35	1.37	1.39	1.17	.98	1.029	1.120	1.104	1.176	1.38	1.43	1.44	1.48	1.52	1.59	1.62	1.64	1.67	....
N	1.29	1.34	1.35	1.37	1.39	1.16	.97	1.037	1.120	1.101	1.178	1.38	1.43	1.46	1.48	1.52	1.60	1.62	1.64	1.68	....
D	1.29	1.33	1.35	1.37	1.39	1.15	.98	1.062	1.120	1.101	1.180	1.39	1.43	1.46	1.48	1.53	1.60	1.62	1.64	1.68	....
Aver.	1.27	1.32	1.35	1.36	1.38	1.27	1.02	1.006	1.097	1.093	1.149	1.32	1.41	1.44	1.47	1.50	1.56	1.615	1.634	1.66	....
Mfg.(1)	.651	.656	.650	.668	.662	.634	.550	.55	.643	.662	.685	.78	.80	.81	.83	.916	1.044	1.163	1.227	1.243	....

COMMON LABOR * (Dollars per Hour)

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
J	.54	.55½	.55	.559	.5628	.5384	.4524	.4271	.5158	.5376	.547	.603	.680	.682	.685	.711	.776	.832	.899	.891	.952
F	.54	.55½	.54½	.564	.5628	.5428	.4521	.4285	.5268	.5241	.547	.603	.675	.680	.685	.713	.780	.832	.869	.891	.968
M	.54½	.56	.54½	.5500	.5610	.5371	.4356	.4272	.5268	.5243	.547	.612	.675	.680	.685	.716	.780	.842	.870	.895	.988
A	.54½	.56	.55	.529	.5646	.5359	.4122	.4343	.5343	.5255	.552	.612	.677	.683	.685	.725	.788	.858	.874	.904	1.004
M	.55	.55½	.55	.5315	.5628	.5394	.4106	.4442	.5343	.5233	.558	.627	.673	.682	.690	.741	.788	.863	.874	.907	....
J	.55	.55½	.55½	.534	.5628	.5394	.4121	.4393	.5343	.5289	.564	.644	.677	.684	.703	.747	.796	.863	.877	.916	....
J	.55½	.55½	.55½	.5296	.5615	.4721	.4114	.4430	.5300	.5289	.563	.662	.677	.684	.707	.753	.803	.863	.882	.916	....
A	.55½	.55½	.5607	.5353	.5615	.4634	.4220	.4430	.5300	.5285	.569	.668	.677	.685	.707	.753	.823	.869	.882	.916	....
S	.55½	.55½	.5607	.5496	.5609	.4665	.4308	.4524	.5349	.5285	.569	.673	.677	.685	.711	.761	.823	.869	.883	.917	....
O	.55	.54½	.5628	.5496	.5596	.4584	.4308	.5057	.5363	.5285	.583	.676	.682	.685	.711	.761	.825	.869	.885	.917	....
N	.55½	.54½	.5653	.5603	.5587	.4559	.4200	.5102	.5388	.5275	.583	.678	.682	.685	.711	.768	.832	.869	.885	.917	....
D	.55½	.55	.5628	.5653	.5503	.4534	.4273	.5202	.5413	.5275	.586	.678	.682	.685	.711	.769	.832	.869	.890	.938	....
Aver.	.548	.554	.5558	.5465	.5607	.5002	.4269	.4562	.5319	.5276	.564	.645	.678	.683	.699	.743	.804	.853	.879	.910	....
Mfg.(2)	.461	.472	.474	.486	.478	.461	.401	.401	.478	.494	.498	.568	.584	.594	.61	.682	.774	.851	.892	.917	....



Use VACUUM CONCRETE FORMS AND CONCRETE LIFTERS

There's real saving in using Vacuum Concrete Forms and Vacuum Concrete Lifters for mass production of Precast Concrete.

The house illustrated is one finished by using Vacuum Forms and Lifters. Uses for the Forms and Lifters cover a wide range including piles, beams, walls, floors, cribbing, posts, large culverts and pipes.

Illustration to the right shows the method of removing Precast Concrete sections from concrete Forms.

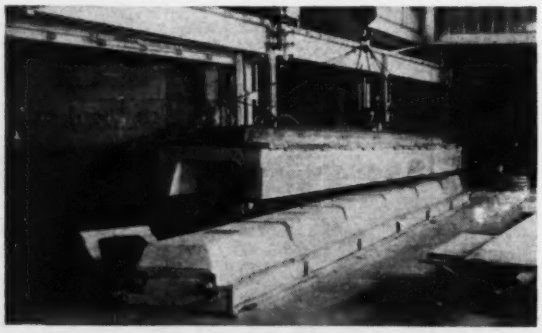
The Vacuum Concrete Process alone does these:

1. **Increases the strength of a plastic mix concrete by an average 100% in the early curing period and by an average of 50% at the age of 28 days and by an average of 30% at the age of 2 years.**
2. **Provides a method whereby prefabricated concrete members can be handled a few hours after pouring them, by use of the Vacuum Concrete Lifter.**

Cast in place floors:

For quick removal of forms, finishing without delay, reducing overtime, better quality, use the Vacuum Concrete Process.

Write today for details



VACUUM CONCRETE INC.

4210 SANSOM STREET • PHILADELPHIA 4, PA.

Yearly Average WAGES OF SIX BUILDING TRADES in Seven Cities

Bricklayers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.65	$0.70	$0.75	$0.70	$0.70	$0.875	$0.75
1914-15	.65	.75	.75	.70	.75	.875	.75
1916	.65	.75	.75	.70	.75	.875	.75
1917	.70	.75	.75	.70	.75	.875	.81
1918	.80	.81	.75	.875	.85	1.00	1.00
1919	.80	.875	.875	.875	1.00	1.125	1.125
1920	1.00	1.25	1.25	1.00	1.25	1.25	1.25
1921	1.00	1.25	1.25	1.00	1.25	1.25	1.125
1922	1.00	1.25	1.10	1.00	1.25	1.25	1.125
1923	1.25	1.50	1.10	1.125	1.50	1.375	1.25
1924	1.25	1.50	1.35	1.125	1.75	1.25	1.25
1925	1.25	1.50	1.50	1.25	1.75	1.25	1.35
1926	1.35	1.645	1.56	1.25	1.75	1.25	1.375
1927	1.40	1.75	1.625	1.25	1.75	1.375	1.375
1928	1.42	1.75	1.625	1.45	1.75	1.375	1.4275
1929	1.50	1.84	1.65	1.50	1.75	1.375	1.50
1930	1.50	1.925	1.70	1.50	1.75	1.375	1.50
1931	1.50	1.7125	1.70	.8125	1.75	1.375	1.1875
1932	1.105	1.47	1.40	.825	1.50	1.175	.975
1933	1.10	1.575	1.406	.812	1.50	1.125	1.01
1934	1.12	1.53	1.50	1.00	1.50	1.50	1.30
1935	1.20	1.50	1.50	1.00	1.50	1.50	1.00
1936	1.28	1.50	1.50	1.00	1.50	1.50	1.00
1937	1.50	1.725	1.62	1.33	1.50	1.60	1.54
1938	1.50	1.886	1.70	1.50	1.50	1.75	1.60
1939	1.50	1.893	1.70	1.50	1.50	1.75	1.60
1940	1.50	1.96	1.70	1.49	1.50	1.75	1.60
1941	1.50	2.00	1.70	1.448	1.396	1.75	1.6375
1942	1.573	2.00	1.721	1.75	1.563	1.771	1.715
1943	1.625	2.00	1.75	1.75	1.75	1.802	1.764
1944	1.625	2.00	1.75	1.75	1.75	1.875	1.829
1945	1.625	2.00	1.84	1.75	1.84	1.875	1.845

Hodcarriers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.35	$0.375	$0.40	.....	$0.4875	$0.50	.....
1914-15	.35	.375	.40	.....	.4875	.50	.....
1916	.35	.375	.425	.....	.4875	.50	.....
1917	.40	.425	.45	.....	.4875	.50	.....
1918	.425	.47	.50	.....	.51	.62½	.....
1919	.50	.575	.575	.....	.6375	.75	.....
1920	.70	.775	1.00	.....	.70	.93	.....
1921	.70	.875	1.00	.....	.85	1.00	$0.875
1922	.70	.875	.725	.....	.85	.71	.875
1923	.70	.95	.725	.....	1.00	.77	.93
1924	.82	1.00	.725	$0.385	1.20	.8125	.95
1925	.7625	1.00	.825	.6075	1.20	.8125	1.00
1926	.77	1.07	.88	.625	1.20	.8125	1.00
1927	.79	1.125	.925	.625	1.20	.875	1.00
1928	.805	1.125	.93125	.52	1.20	.875	1.00
1929	.85	1.15	.93	.50	1.20	.875	1.00
1930	.85	1.03125	.975	.50	1.20	.875	1.00
1931	.85	1.025	.975	.35	.875	.875	.70
1932	.70	1.00	.825	.40	1.00	.70	.80
1933	.70	.91	.....	.....	1.00	.70	.80
1934	.70	.825	.825	.....	.875	.70	1.00
1935	.70	.825	.825	.....	.875	.70	1.00
1936	.77	.825	.95	.30-.40	.875	1.00	1.00
1937	.85	1.14	1.025	.40	1.00	1.10	1.15
1938	.85	1.14	1.025	.40	1.00	1.25	1.15
1939	.85	1.14	1.025	.40	1.00	1.25	1.15
1940	.85	1.186	1.025	.40	1.00	1.25	1.15
1941	.85	1.214	1.025	.4583	1.00	1.25	1.15
1942	1.00	1.214	1.063	.65	1.071	1.25	1.265
1943	1.00	1.214	1.063	.65	1.15	1.40	1.33
1944	1.00	1.214	1.10	.65	1.15	1.40	1.395
1945	1.028	1.215	1.215	.641	1.056	1.072	1.172

Carpenters

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.50	$0.625	$0.65	$0.525	$0.625	$0.625	$0.56
1914-15	.55	.625	.65	.45	.625	.625	.56
1916	.57	.625	.70	.45	.625	.625	.56
1917	.60	.69	.70	.45	.65	.68	.65
1918	.65	.69	.70	.55	.70	.75	.825
1919	.75	.75	.80	.65	.825	.875	.93
1920	1.00	1.125	1.25	.75	1.00	1.06	1.00
1921	1.00	1.125	1.25	.75	1.25	1.125	.875
1922	1.00	1.125	1.10	.75	1.10	1.04	.875
1923	1.05	1.125	1.25	.75	1.25	1.04	1.00
1924	1.05	1.3125	1.17	.76	1.525	1.00	1.00
1925	1.0875	1.3125	1.3475	.6025	1.50	1.00	1.0825
1926	1.20	1.45	1.39	.6575	1.50	1.00	1.125
1927	1.25	1.50	1.30	.95	1.50	1.125	1.125
1928	1.279	1.50	1.50	1.00	1.50	1.125	1.125
1929	1.38	1.55	1.47	1.00	1.50	1.125	1.125
1930	1.375	1.65	1.625	1.00	1.50	1.125	1.125
1931	1.175	1.45	1.625	.60	1.50	1.125	.875
1932	1.04	1.33	1.40	.60	1.275	.96	.695
1933	1.065	1.375	1.3125	.60	1.25	.90	.73
1934	.9375	1.40	1.3125	1.00	1.25	1.05	.83
1935	.9275	1.40	1.3156	1.00	1.25	1.10	1.00
1936	.937	1.40	1.50	.88	1.25	1.12	1.00
1937	1.14	1.60	1.57	1.06	1.35	1.31	1.23
1938	1.343	1.75	1.625	1.125	1.25	1.25	1.25
1939	1.375	1.75	1.625	1.125	1.25	1.25	1.25
1940	1.375	1.81	1.625	1.125	1.333	1.25	1.25
1941	1.24	1.85	1.625	1.099	1.333	1.291	1.325
1942	1.417	1.85	1.656	1.167	1.50	1.385	1.415
1943	1.50	1.85	1.70	1.219	1.50	1.479	1.464
1944	1.50	1.85	1.70	1.25	1.50	1.50	1.544
1945	1.50	1.85	1.756	1.281	1.62	1.50	1.55

Plasterers

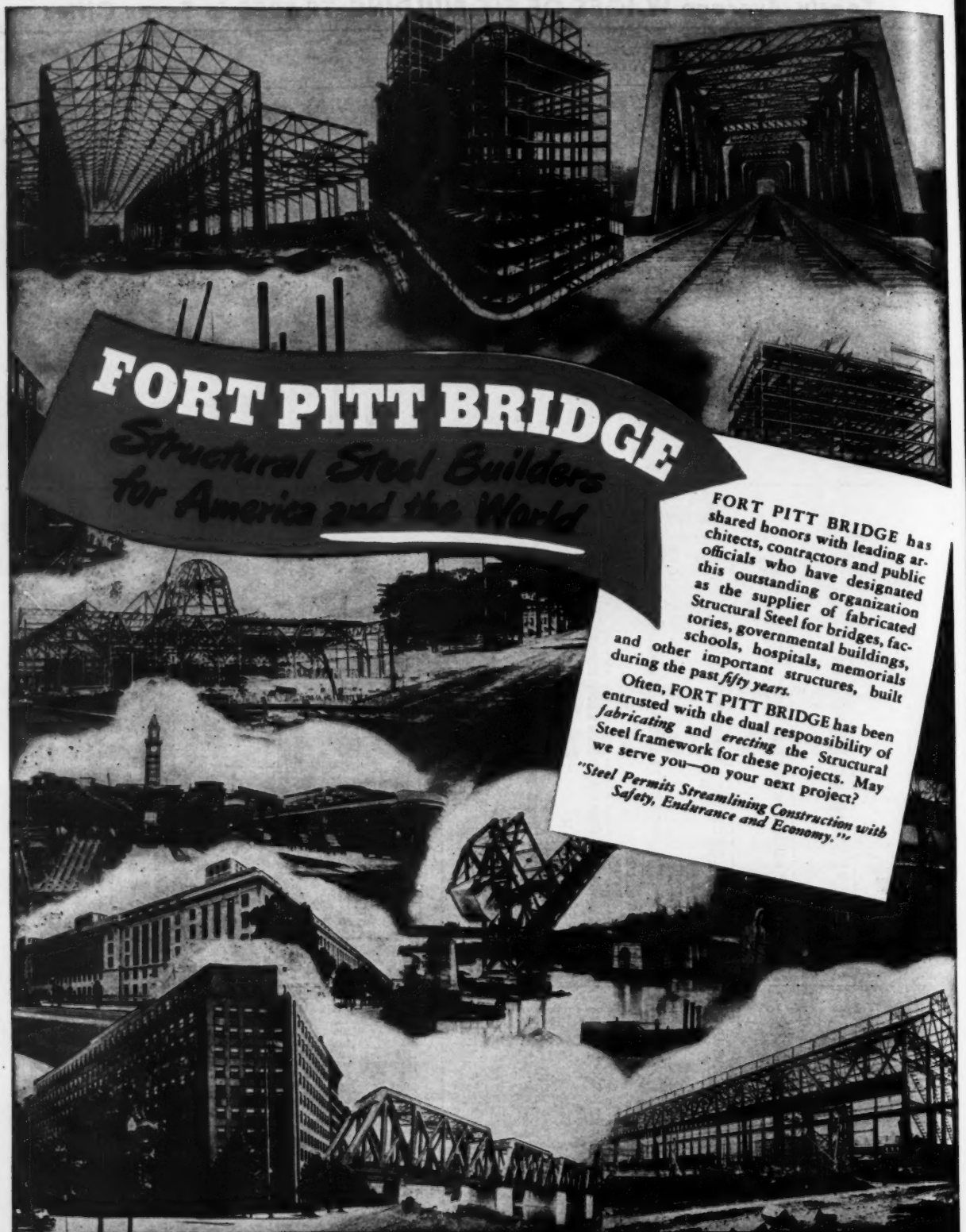
	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.65	$0.69	$0.75	.....	$0.75	$0.875	$0.75
1914-15	.65	.69	.75	.....	.75	.875	.75
1916	.70	.75	.75	.....	.75	.875	.75
1917	.70	.75	.75	.....	.75	.875	.875
1918	.70	.75	.81	.....	.875	1.00	1.00
1919	.80	.90	.875	.....	1.00	1.125	1.125
1920	1.00	1.25	1.25	.....	1.25	1.25	1.25
1921	1.25	1.25	1.25	.....	1.375	1.375	1.25
1922	1.125	1.25	1.10	.....	1.375	1.275	1.125
1923	1.125	1.25	1.50	.....	1.50	1.275	1.25
1924	1.25	1.50	1.50	.....	1.75	1.275	1.375
1925	1.25	1.50	1.50	.....	1.75	1.50	1.375
1926	1.50	1.75	1.50	.....	1.75	1.50	1.375
1927	1.50	1.75	1.625	.....	1.75	1.50	1.375
1928	1.50	1.75	1.625	.....	1.75	1.50	1.50
1929	1.50	1.75	1.625	.....	1.75	1.375	1.50
1930	1.625	1.925	1.70	.....	1.75	1.375	1.50
1931	1.50	1.7125	1.70	$1.00	1.75	1.375	1.1875
1932	1.025	1.50	1.375	1.25	1.50	1.10	1.20
1933	1.375	1.50	1.375	.....	1.50	1.10	1.20
1934	1.231	1.50	1.50	1.00	1.50	1.38	1.18
1935	1.375	1.50	1.50	1.00	1.50	1.25	1.375
1936	1.375	1.50	1.50	1.00	1.50	1.35	1.25
1937	1.625	1.80	1.62	1.00	1.51	1.51	1.54
1938	1.625	2.00	1.70	1.00	1.58	1.65	1.60
1939	1.625	2.00	1.70	1.00	1.58	1.60	1.60
1940	1.625	2.00	1.70	1.00	1.721	1.60	1.60
1941	1.625	2.00	1.70	1.271	1.75	1.639	1.6375
1942	1.65	2.00	1.825	1.50	1.75	1.681	1.715
1943	1.667	2.00	1.825	1.50	1.75	1.75	1.764
1944	1.667	2.00	1.825	1.50	1.75	1.75	1.844
1945	1.667	2.00	1.844	1.61	1.75	1.75	1.850

Structural Ironworkers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.625	$0.625	$0.68	$0.625	$0.65	$0.75	$0.625
1914-15	.625	.625	.68	.625	.65	.75	.625
1916	.625	.66	.68	.625	.675	.75	.625
1917	.68	.68	.69	.625	.70	.75	.75
1918	.80	.80	.70	.75	.80	.875	.875
1919	.80	.875	.875	.80	.925	1.00	1.00
1920	1.00	1.125	1.25	1.00	1.25	1.125	1.125
1921	1.00	1.125	1.25	.....	1.25	1.25	1.125
1922	1.00	1.125	1.05	.....	1.06	1.125	1.00
1923	1.05	1.125	1.05	1.05	1.25	1.125	1.125
1924	1.16	1.29	1.25	1.00	1.45	1.125	1.125
1925	1.1375	1.4675	1.36	1.135	1.50	1.125	1.125
1926	1.23	1.60	1.405	1.25	1.50	1.125	1.125
1927	1.25	1.75	1.50	1.55	1.50	1.375	1.155
1928	1.3125	1.75	1.50	1.75	1.50	1.375	1.215
1929	1.375	1.81	1.57	1.63	1.57	1.375	1.25
1930	1.375	1.925	1.625	1.25	1.75	1.375	1.25
1931	1.375	1.925	1.625	.75	1.75	1.375	1.1875
1932	1.205	1.675	1.375	.75	1.50	1.13	1.13
1933	1.14	1.65	1.35	.75	1.47	1.20	1.10
1934	1.20	1.62	1.35	1.00	1.47	1.375	1.13
1935	1.20	1.65	1.35	1.125	1.47	1.375	1.23
1936	1.20	1.58	1.50	1.10	1.47	1.375	1.25
1937	1.375	1.79	1.58	1.25	1.73	1.44	1.39
1938	1.479	1.925	1.70	1.25	1.75	1.50	1.50
1939	1.60	1.925	1.70	1.25	1.75	1.50	1.50
1940	1.5625	1.9625	1.70	1.302	1.75	1.60	1.50
1941	1.50	2.00	1.70	1.469	1.75	1.60	1.5375
1942	1.588	2.00	1.725	1.50	1.75	1.625	1.615
1943	1.65	2.00	1.76	1.50	1.75	1.75	1.664
1944	1.65	2.00	1.76	1.50	1.75	1.75	1.729
1945	1.666	2.00	1.805	1.594	1.79	1.75	1.745

Common Laborers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.35	$0.225	$0.40	.....	$0.25	$0.27	$0.375
1914-15	.35	.225	.40	.....	.25	.31	.375
1916	.35	.25	.425	.....	.25	.31	.375
1917	.375	.30	.45	.....	.30	.375	.4375
1918	.40	.405	.50	.....	.365	.43	.56
1919	.40	.405	.575	.....	.425	.625	.6875
1920	.6875	.75	1.00	.....	.6075	.75	.75
1921	.6875	.60	1.00	.....	.6075	.81	.75
1922	.6875	.60	.725	.....	.5575	.625	.625
1923	.6875	.615	.725	.....	.6075	.625	.625
1924	.6625	.6875	.8175	$0.335	.70	.525	.625
1925	.6025	.6525	.8175	.31	.6525	.525	.5625
1926	.615	.815	.86	.30	.6525	.525	.5675
1927	.595	.90625	.8875	.325	.5875	.55	.64
1928	.6025	.90625	.90	.325	.60	.55	.678
1929	.625	.985	.92	.29	.61	.57	.70
1930	.625	1.03125	.975	.275	.6375	.6875	.70
1931	.60	.65625	.7375	.20	.6125	.59375	.60
1932	.575	.645	.665	.225	.56	.56	.485
1933	.548	.725	.784	.248	.6223	.64	.48
1934	.55	.8475	.825	.30	.7875	.64	.53
1935	.575	.68	.825	.30	.7875	.625	.60
1936	.581	.65	.95	.35	.7875	.651	.60
1937	.725	.91	.99	.35	.86	.75	.87
1938	.735	.912	1.025	.35	.663	.65	1.00
1939	.725	.912	1.025	.35	.663	.65	.906
1940	.725	.912	1.025	.35	.804	.745	.90
1941	.7875	.934	1.025	.4167	.875	.842	.975
1942	.879	.991	1.056	.6375	.8875	.8875	1.058
1943	.90	.991	1.10	.65	.95	.95	1.082
1944	.95	1.0213	1.10	.65	.9625	.9875	1.116
1945	1.00	1.06	1.16	.65	1.00	1.00	1.145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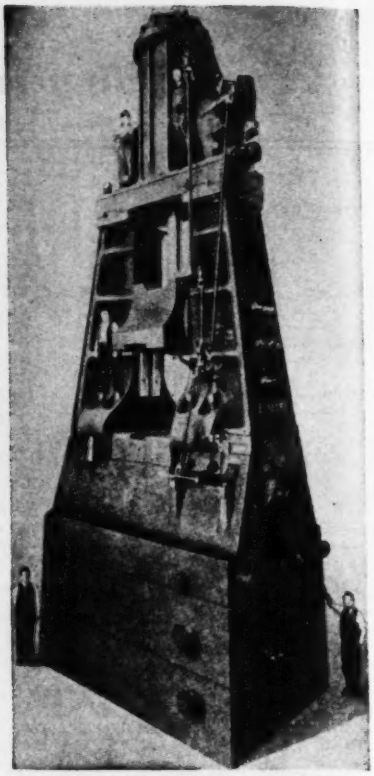
(Prevailing March 1, 1946.—Compiled by Engineering News-Record)

City and State	Carpenters	Bricklayers	Structural Ironworkers	Common Labor—Buildings	Common Labor—Heavy Constr.	Stonemasons	Mason's Helpers	Plasterers	Mosaic and Terrazzo	Tile Layers	Cement Finishers	Laborers	Electric Workers (Inside)	Painters	Glaziers	Plumbers	Steamfitters	Roofers	Waterproofers	Sheet Metal Workers	Welders	Hoisting Eng.—1-Drum	Hoisting Eng.—2-Drum	Tractor Operator (Over 30-hp.)	Power Shovel Operator	Truck Drivers (Over 1½ Tons)
Anderson, Ind.	$1.43	$1.64	$1.75	$ .80	$ .95	$1.64	$1.03	$1.63	.....	$ .95	$1.38	$1.63	$1.50	$1.25	$1.43	$1.50	$1.50	$1.25	$1.25	$1.63	$1.40	$1.70	$1.70	$1.65	$1.70	$ .80
Austin, Tex.	1.50	2.00	1.50	.50	.50	1.50	.65	1.75	1.50	1.50	1.50	1.50	1.63	[4]1.25	1.13	1.63	1.50	1.13	.....	1.50	1.50	1.25	1.50	1.25	1.50	1.00
Baltimore, Md.	1.68	1.90	1.90	.95	.95	1.90	1.05	1.73	1.75	1.75	1.50	1.73	1.73	1.43	1.44	1.65	1.65	[5]1.58	1.38	1.63	[3]	1.63	2.00	1.25	2.00	.85
Birmingham, Ala.	1.38	1.94	1.63	.60	.70	1.94	.70	1.65	1.94	.....	1.50	1.38	1.75	1.50	1.50	1.75	1.75	[3]1.30	1.30	1.45	[3]	1.38	1.63	1.38	1.63	[6]1.25
Bismarck, N. D.	1.40	1.75	1.25	.90	.90	1.25	.75	1.40	.....	.....	1.25	1.25	1.25	1.25	1.25	1.25	.....	.....	.....	1.25	1.25	.....	.....	1.25	1.25	.90
Boise, Idaho.	1.25	.....	.....	.90	.....	.....	.....	1.50	.....	.....	1.38	1.38	1.50	[4]1.29	.....	1.50	1.50	[5]1.25	.....	1.25	1.60	.....	.....	.....	.....	1.13
Boston, Mass.	1.60	1.73	1.73	1.15	1.15	1.73	1.15	1.80	1.73	1.63	1.67	1.80	1.73	1.44	1.58	1.73	1.73	1.65	1.65	1.73	[3]	1.65	1.65	1.65	2.03	.93
Buffalo, N. Y.	1.60	1.83	1.75	1.00	1.00	1.83	1.15	1.75	1.50	1.50	1.58	1.75	1.75	1.50	1.50	1.75	1.75	1.45	.....	1.60	.....	1.75	1.75	.....	1.75	1.00
Charleston, S. C.	1.25	1.50	1.25	.60	.60	1.50	.75	1.38	1.50	1.50	1.25	1.25	.....	1.25	.....	1.75	1.75	1.25	1.25	1.25	.....	1.25	1.25	.....	.....	.....
Charleston, W. Va.	1.50	1.90	1.63	.75	.75	1.90	.90	1.50	1.50	1.50	1.25	1.59	1.63	1.50	1.25	1.63	1.63	1.38	1.38	1.38	1.63	1.38	1.63	1.38	1.63	.83
Charlotte, N. C.	1.13	1.45	1.50	.60	.60	1.45	.60	1.00	1.45	1.45	1.25	1.38	1.25	[4]1.12	1.00	1.50	1.50	1.25	1.25	1.25	[3]	1.15	1.40	.85	1.40	.75
Chicago, Ill.	1.85	1.90	1.88	1.20	1.20	1.90	1.20	1.90	1.85	1.85	1.84	1.90	1.98	1.82	2.03	1.95	1.85	1.90	1.90	1.85	1.88	1.85	2.15	1.55	2.15	.95
Cincinnati, Ohio.	1.65	1.88	1.78	.95	.95	1.88	1.15	1.88	1.58	1.58	1.55	1.63	1.73	1.60	1.78	1.73	1.73	[5]1.63	[3]1.63	1.55	[3]	1.88	2.13	1.88	2.13	.96
Cleveland, Ohio.	1.65	2.00	2.00	1.25	1.25	2.00	1.25	2.00	1.70	1.85	1.70	1.88	2.00	1.68	1.75	1.85	1.73	[5]2.00	1.75	1.75	1.85	[4]1.43	[4]2.00	2.00	2.00	[4]1.97
Columbia, S. C.	1.13	1.50	1.50	[a].65	.65	1.50	[a].65	1.50	1.50	1.50	1.50	[10]1.25	1.25	[4]1.25	1.50	1.50	1.50	1.13	1.13	1.25	1.25	1.25	1.25	1.25	1.25	.75
Columbus, Ohio.	1.50	1.88	1.73	.93	.93	1.88	.93	1.75	1.25	1.25	1.50	1.65	1.63	1.45	1.45	1.58	1.58	1.50	1.58	1.63	1.73	1.50	1.50	1.63	1.88	.80
Concord, N. H.	1.15	1.50	1.65	.75	.75	.....	.95	1.50	.....	.....	1.75	1.75	1.25	1.00	1.00	1.25	1.25	.90	1.38	.....	.....	1.35	1.35	1.25	1.65	.90
Conway, Ark.	[b]1.25	1.50	.....	.40	.50	1.50	.60	1.50	.....	.....	1.50	1.50	1.38	1.00	.....	1.50	1.50	[c]1.00	.....	.....	.....	.....	.....	.....	.....	.....
Dallas, Tex.	1.43	1.94	1.63	.70	.70	1.94	.70	1.75	1.75	1.75	1.57	1.75	1.75	1.43	1.35	1.75	1.75	1.28	1.28	1.63	1.75	1.38	1.63	1.63	1.63	1.38
Dayton, Ohio.	1.65	1.90	1.90	.85	[d].90	1.90	1.25	1.80	1.65	1.65	1.65	1.65	1.85	1.60	1.70	1.90	1.90	1.65	1.65	1.55	.....	1.65	1.65	1.50	1.70	1.10
Denver, Colo.[1]	1.70	1.98	1.70	1.00	1.25	1.98	1.24	1.90	1.90	1.90	1.70	1.90	1.85	1.60	1.90	1.85	1.85	1.70	1.70	1.70	[3]	1.70	1.82	1.70	1.83	1.60
Des Moines, Iowa.	1.43	1.75	1.58	.85	.85	1.75	.85	1.58	[11]1.25	1.44	1.43	[10]1.50	1.55	[4]1.33	1.25	1.55	1.55	[5]1.15	. . .	1.50	[3]	1.48	1.55	1.55	1.55	.85
Detroit, Mich.	1.63	1.90	1.83	1.15	1.15	1.90	1.15	1.90	1.75	1.80	1.50	1.90	1.85	1.50	1.44	1.90	1.90	[5]1.95	1.55	1.75	[3]	[12]1.68	[12]1.83	1.68	1.68	1.15
Duluth, Minn.	1.38	1.50	1.63	.80	.90	1.50	.90	1.50	...	1.50	1.25	1.45	1.40	[13]1.25	.98	1.38	1.38	.....	1.25	1.30	[c]1.20	1.70	1.85	1.20	1.70	1.00
Erie, Pa.	1.38	1.75	1.68	.83	1.00	1.75	.93	1.73	1.50	1.50	1.50	1.75	1.50	1.28	1.25	1.50	1.50	1.25	1.25	1.25	[bb]1.68	1.38	1.63	1.63	1.75	[i].95
Fort Worth, Tex.	1.30	1.73	1.50	.75	.75	1.38	.75	1.68	1.50	1.50	1.38	1.75	1.25	1.25	1.25	1.50	1.38	1.30	1.30	1.50	1.25	1.25	1.38	1.38	1.50	.75
Harrisburg, Pa.	1.38	1.75	1.75	.80	.80	1.75	1.00	1.63	1.38	1.40	1.63	1.63	1.50	1.20	1.20	1.44	1.44	1.15	.....	1.38	[3]	1.75	.....	1.75	1.85	.75
Helena, Mont.	1.38	1.50	1.50	.90	.90	1.50	1.13	1.50	1.50	1.50	1.50	2.00	1.38	1.38	1.50	1.50	1.50	1.38	1.25	1.38	1.50	1.50	1.75	1.50	1.50	1.50
Houston, Tex.	1.63	2.00	1.88	.80	.80	2.00	.80	1.88	1.75	1.75	1.63	1.88	1.88	1.50	1.50	1.88	1.88	1.38	1.38	1.75	[3]	1.50	1.75	1.50	1.75	1.15
Indianapolis, Ind.	1.50	1.80	1.75	.85	.....	1.75	1.18	1.75	1.55	1.75	1.43	1.63	1.70	1.50	1.43	1.70	1.70	1.25	1.25	1.55	[3]	1.50	1.70	1.70	1.70	.93
Jacksonville, Fla.	1.25	1.63	1.63	[b].70	[b].70	1.63	[b].70	[ee]1.75	1.63	1.63	[b]1.50	[ee]1.75	1.68	[4]1.25	1.25	1.70	1.70	[c]1.25	[c]1.25	1.25	1.50	1.25	1.50	1.25	1.50	.75
Jamestown, N. Y.	1.38	1.75	1.68	.83	1.00	1.75	.93	1.73	1.50	1.50	1.50	1.75	1.50	1.28	1.25	1.50	1.50	1.25	1.25	1.25	[bb]1.68	1.38	1.63	1.63	1.75	[i].95
Jefferson City, Mo.	1.25	1.75	1.90	.90	.90	1.75	1.15	1.75	.....	.....	1.50	1.25	1.35	1.25	1.25	1.50	1.50	1.25	.....	1.00	1.50	2.25	2.25	1.50	2.00	1.15
Kansas City, Mo.	1.58	1.75	1.70	.98	.....	1.50	1.03	1.75	1.45	1.58	1.58	1.65	1.75	1.58	1.68	1.70	1.70	1.44	1.38	1.68	.....	1.58	1.70	.....	.....	1.05
Little Rock, Ark.	1.38	1.38	1.50	.50	.65	1.50	.75	1.50	.....	.....	1.25	1.25	1.38	1.25	1.25	1.50	1.50	1.25	1.25	1.50	1.50	1.25	1.38	.....	.....	.....
Los Angeles, Calif.[2]	1.50	1.73	1.75	[g]1.25	[g]1.25	1.73	1.25	1.75	1.62	1.44	1.63	1.75	1 70	1.50	1.35	1.75	1.75	1.43	1.43	1.50	[3]	1.50	1.50	1.50	1.75	1.08
Meridian, Miss.	1.25	1.75	2.00	.65	.75	1.75	.75	1.50	1.50	1.50	1.50	1.25	1.68	1.25	1.25	1.68	1.68	1.25	.....	1.25	1.50	1.13	1.38	1.25	1.38	.75
Milwaukee, Wis.	1.43	1.67	1.58	1.10	1.10	1.67	.....	1.58	1.50	1.58	1.50	1.58	1.65	1.30	1.55	1.70	1.70	[5]1.60	1.45	1.40	1.58	1.45	1.45	1.40	1.75	1.05
Minneapolis, Minn.	1.50	1.69	1.75	1.01	1.01	1.69	1.11	1.73	1.55	1.55	1.50	1.73	1.65	1.50	1.25	1.65	1.65	1.48	1.48	1.60	[3]	1.60	1.60	[ff]1.50	1.85	[c]1.35
Nashville, Tenn.	1.40	[ee]2.00	1.63	.75	.75	[ee]2.00	.85	1.75	1.25	1.25	1.25	1.73	1.50	1.38	1.13	1.58	1.58	[3]1.25	.....	1.38	[c]1.50	1.00	1.25	1.25	1.50	[i].85
New Orleans, La.	1.38	1.75	1.63	.70	.80	1.75	1.00	1.63	.....	1.63	1.38	1.63	1.63	1.25	1.31	1.75	1.75	1.30	1.30	1.45	1.45	1.30	1.55	1.38	1.55	.75
New York, N. Y.	[72]2.10	[72]2.25	2.25	1.25	1.20	[72]2.25	[71]1.40	[62]2.25	[72]2.00	1.94	[72]2.10	[72]2.10	[62]2.00	[71]1.84	[72]2.14	[72]2.25	[57]2.25	[71]1.85	[72]2.25	[3]	[3]	1.88	2.18	.....	.....	.....
Ogden, Utah.	1.38	1.75	1.75	.88	.88	1.75	1.25	1.75	1.50	1.38	1.50	1.50	1.50	[ee]1.75	1.13	1.50	1.50	1.25	1.25	1.50	[3]	1.38	1.50	1.50	[i]1.65	[k]1.50
Oklahoma City, Okla.	1.44	1.75	1.75	.85	.75	1.68	.90	1.50	1.63	1.50	1.75	1.50	1.75	1.38	1.45	1.75	1.75	1.25	1.25	1.38	1.38	1.25	1.38	1.25	1.38	.85
Omaha, Nebr.	1.45	1.65	1.58	.85	.95	1.65	.95	1.58	1.45	1.38	1.45	1.50	1.23	1.25	1.26	[51]1.58	[51]1.58	1.25	1.25	[15a]1.05	[15a]1.00	1.25	1.50	[c]1.35	1.50	.85
Philadelphia, Pa.	1.65	2.00	1.90	[16]1.90	[16]1.90	1.75	1.25	2.00	1.50	1.63	1.58	1.88	2.00	[c]1.63	1.63	1.75	1.75	[c]1.70	1.58	1.73	[3]	1.95	1.95	[18]1.85	[19]1.95	.93
Phoenix, Ariz.	1.63	1.85	1.75	1.00	.....	1.85	1.38	1.85	1.85	1.85	1.63	1.75	1.50	[c]1.50	1.50	1.75	1.75	1.43	.....	1.50	.....	.....	.....	.....	1.75	.....
Pittsburgh, Pa.	1.75	2.00	1.75	1.00	1.00	1.75	1.25	1.88	1.50	1.75	1.75	1.88	1.88	1.73	1.61	1.75	1.75	1.63	1.63	1.70	1.50	1.81	1.81	1.50	1.81	.95
Providence, R. I.	1.35	1.6	1.73	1.00	.....	1.65	1.25	1.80	1.65	1.65	1.55	1.80	1.50	1.25	1.35	1.70	1.70	[c]1.50	1.80	1.50	[3]	.....	.....	.....	.....	.....
Raleigh, N. C.	1.13	1.50	1.50	.60	[a].75	1.50	.60	1.38	1.50	1.50	1.25	1.38	1.10	1.25	1.00	1.50	1.50	[c]1.00	.75	1.00	[g]1.25	1.15	1.40	[f]1.15	1.40	.75
Richmond, Va.	1.30	1.73	1.73	.60	[d].75	1.73	1.50	1.63	1.73	1.73	1.25	1.50	1.50	1.25	1.25	1.50	1.50	.....	.....	.....	1.50	1.38	1.63	1.63	[44]1.80	1.10
St. Louis, Mo.	1.70	2.00	1.90	1.00	1.15	1.75	1.00	1.90	1.50	1.70	1.81	[10]1.90	1.88	1.65	1.75	1.75	1.75	[5]1.88	1.58	1.73	1.65	2.20	2.20	2.20	2.20	[20]1.00
St. Paul, Minn.	1.50	1.69	1.75	1.01	1.01	1.69	1.11	1.73	1.55	1.55	1.50	1.73	1.65	1.50	1.25	[c]65	1.65	1.48	1.48	1.60	.....	1.60	1.60	[41]1.50	1.65	[c]1.35
St. Petersburg, Fla.	1.38	1.75	1.63	.80	.90	1.75	.90	1.75	1.75	1.75	1.50	1.50	1.63	1.25	1.25	1.63	1.63	1.25	1.25	1.50	1.63	1.25	1.25	1.00	1.50	.85
Salt Lake City, Utah.	1.38	1.75	1.75	.88	.88	1.75	1.25	1.75	1.50	1.38	1.50	[10]1.50	1.50	[ee]1.75	1.13	1.50	1.50	1.25	1.25	1.50	[3]	1.38	1.50	1.50	1.65	[b]1.50
San Antonio, Tex.	1.44	1.73	1.50	.58	.58	1.65	.50	1.65	1.50	1.50	1.50	1.50	1.63	1.13	1.13	1.63	1.63	1.25	[3]	1.50	[3]	1.25	1.50	1.25	1.50	[21].75
San Diego, Calif.[2]	1.50	1.73	1.75	[g]1.25	[g]1.25	1.73	1.25	1.75	1.62	1.44	1.63	1.75	1.70	1 50	1.35	1.75	1.75	1.43	1.43	1.50	[3]	1.50	1.50	1.50	1.75	1.08
San Francisco, Calif.	1.75	[g]2.05	1.75	1.07	1.07	1.88	1.58	[g]2.00	1.50	1.80	1.75	[g]2.00	1.88	[71]1.75	1.59	1.88	.....	1.75	[ee]1.63	1.75	[23]1.75	1.80	2.00	2.00	2.00	1.13
Seattle, Wash.	1.61	1.91	1.81	1.21	1.21	1.91	1.46	1.91	1.66	1.66	1.61	1.81	1.81	1.61	[c]1.50	1.81	1.81	1.61	1.61	1.76	1.81	1.90	1.90	1.90	2.20	1.35
Springfield, Ill.	1.63	1.88	1.75	1.00	.90	1.88	1.15	1.75	1.88	1.35	1.50	1.63	1.75	1.63	1.50	1.90	1.90	1.40	1.61	1.40	[3]	1.35	1.75	[17]1.75	1.75	1.00
Tacoma, Wash.	1.61	1.91	1.81	1.21	1.21	1.91	1.46	1.91	1.66	1.66	1.61	1.81	1.81	1.61	[c]1.50	1.81	1.81	1.61	1.61	1.76	1.81	1.90	1.90	1.90	2.20	1.35
Toledo, Ohio.	1.58	1.85	1.88	1.00	.....	1.80	1.03	[71]1.80	1.35	1.60	1.83	[71]1.80	1.80	[c]1.50	1.33	1.73	1.73	1.50	1.83	1.80	[3]	[23]1.50	[24]1.63	[25]1.50	1.88	1.00
Topeka, Kan.	1.25	1.65	1.58	.75	1.00	1.65	1.00	1.58	1.50	1.50	1.44	1.38	1.50	1.20	1.20	1.50	1.50	1.38	1.25	1.50	1.38	1.50	1.63	1.05	1.50	1.05
Trenton, N. J.[2]	1.68	1.90	2.15	.93	.....	1.90	.93	1.90	1.90	1.90	1.90	1.78	2.25	[c]1.58	1.25	1.90	1.90	1.85	1.85	1.90	[3]	2.25	2.25	1.75	[22]2.50	1.00
Tulsa, Okla.	1.50	1.75	1.75	.90	.85	1.68	1.00	1.63	1.63	1.50	1.63	1.50	1.88	1.38	1.50	1.75	1.75	1.25	1.25	1.50	1.38	1.38	1.50	1.38	1.50	.85
Wilmington, Del.	1.68	1.87	2.15	.90	.90	.....	.....	1.73	1.50	1.50	1.75	1.50	1.75	1.50	1.55	1.75	1.75	[ff]1.90	.....	1.70	.....	[27]1.65	[27]1.65	.....	.....	.....

NOTE: Hourly rates are rounded to closest cent where fractional parts of cent are quoted. [1] As of April 1, 1946. [2] As of March 15, 1946. [3] Rate of craft with which they work [4] Brush. [5] Slate and tile. [6] Day 9 hr. [7] Day 7 hr. [8] Day 6 hr. [9] Day 6 and 7 hr. [10] Metal. [11] Terrazzo only. [12] On steel work. [13] Inside $1.25; outside $1.50. [14] Without power takeoff $1.50; with $1.70. [15] Week 44 hr. [16] Caisson work $1.20. [17] Without power takeoff $1.50; with $1.75. [18] Weekly $1.75; daily $1.85. [19] Weekly $1.85; daily $1.95. [20] Material 90c to $1.00; excavating $1.25. [21] Winch $1.50. [22] Shop $1.35; field $1.75. [23] Elevator. [24] M speed. [25] $1.50 plus. [26] On building. Hoist $2.38. [27] Weekly $1.65. daily $1.90.

WAGE RATE RANGES: [a] 60c to 65c. [b] 60c to 70c. [c] 60c to 75c. [d] 70c to 75c. [e] 70c to $1.25. [f] 75c to 85c. [g] 75c to $1.00. [h] 75c to $1.25. [i] 85c to 90c. [j] 85c to $1.15. [k] 85c to $1.50. [l] 90c to 95c. [m] 90c to $1.00. [n] 95c to $1.05. [o] 95c to $1.20. [p] $1.00 to $1.25. [q] $1.00 to $1.35. [r] $1.00 to $1.50. [s] $1.13 to $1.25. [t] $1.13 to $1.35. [u] $1.25 to $1.50. [v] $1.30 to $1.45. [w] $1.38 to $1.75. [x] $1.40 to $1.50. [y] $1.43 to $1.63. [z] $1.43 to $2.00. [aa] $1.50 to $1.63. [bb] $1.50 to $1.68. [cc] $1.50 to $1.75. [dd] $1.63 to $1.80. [ee] $1.68 to $2.00. [ff] $1.70 to $1.90.

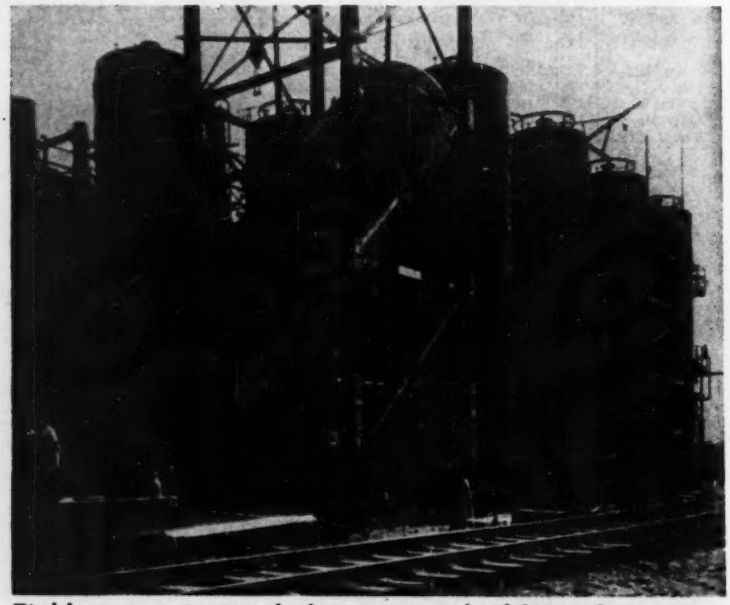
12,000 ton Bell Telephone Co. building, Indianapolis, Ind. was moved 52 ft. and pivoted 90 degrees to front on another street.



Erie Steam Hammer (450 tons) installed in a Defense Corp. Plant.

Views showing progress of the work of erecting converters at Butadiene-Styrene Plant, Kobuta, Pa.

The old furnace continued to produce pig iron while this new furnace was being erected 112 feet away. The old furnace was then dismantled and the new furnace moved on to the old foundation.



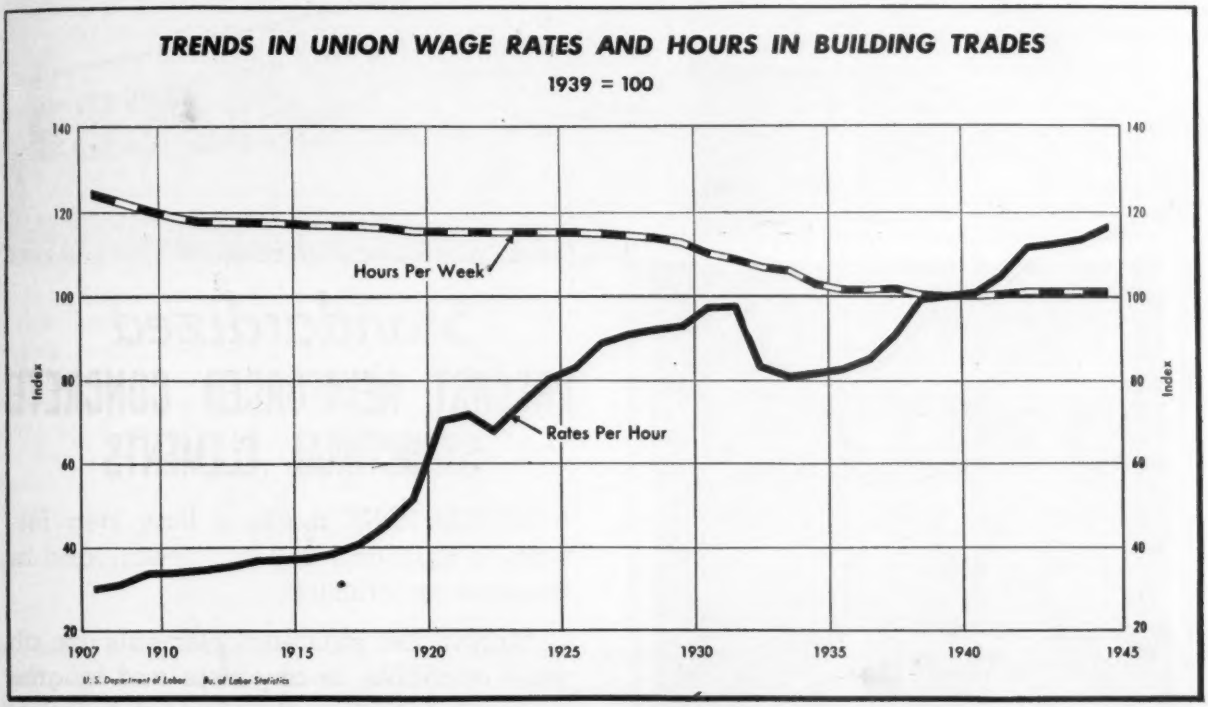
MOVING • SHORING
RIGGING • FOUNDATIONS
UNDERPINNING • NEW EQUIPMENT INSTALLATION
PLANT RECONDITIONING
STEEL ERECTION

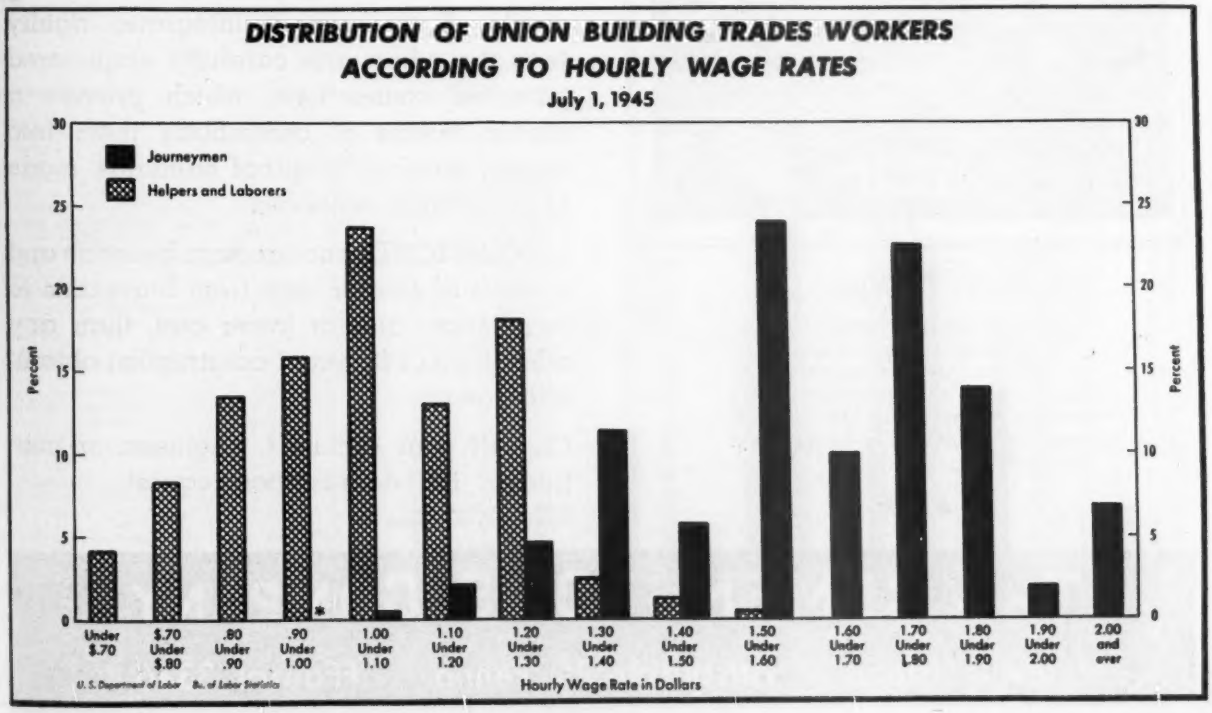
Eichleay service includes moving buildings for street widening and other civic improvements—as well as for business and industrial expansion. Structures are moved without interrupting normal activities. Write for these booklets — "Moved by Eichleay" — "Installed by Eichleay".

EICHLEAY, 33 S. 19th Street, Pittsburgh, Pa.

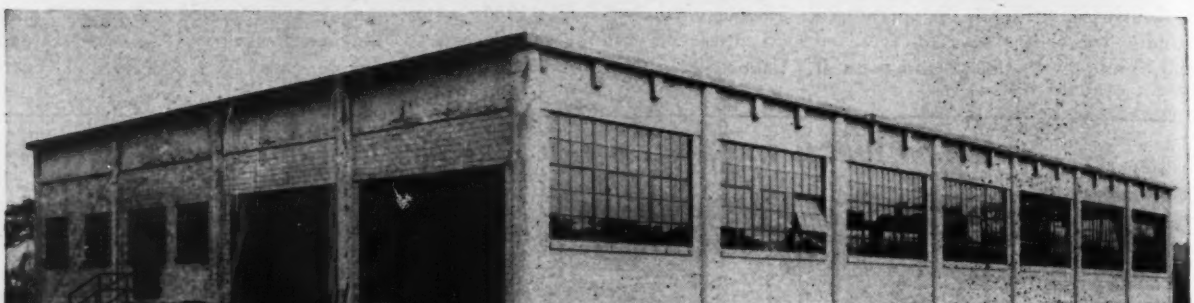
Labor Department Analysis of Union Building Wages

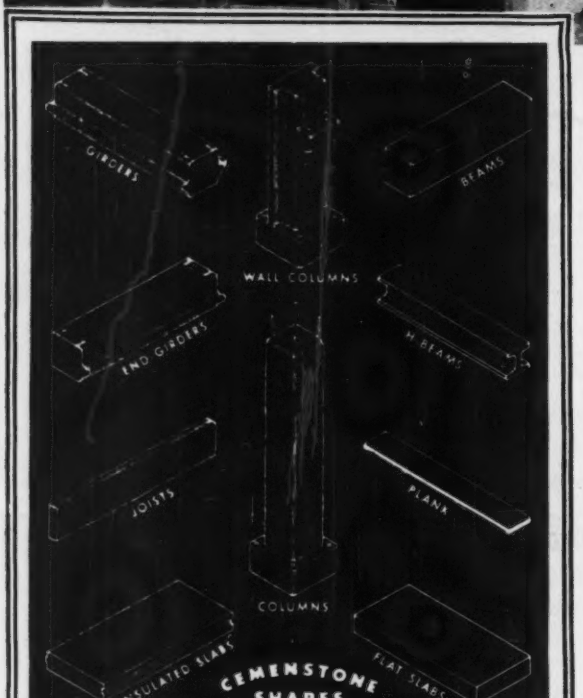
Hourly wage rates for organized building-trades journeymen averaged $1.615 on July 1, 1945, an increase of 1.8 percent over July 1, 1944, in the 75 cities surveyed by the Bureau of Labor Statistics, U. S. Department of Labor, and reported in Monthly Labor Review, February, 1946. Helpers and laborers averaged $0.997, a 4.7 per-





CEMENSTONE





Standardized

PRECAST REINFORCED CONCRETE STRUCTURAL ELEMENTS

* CEMENSTONE marks a long step forward in industrial building design, and in fireproof construction.

CEMENSTONE structural elements are always available, in any sizes and lengths up to 50 feet, for all industrial building needs. Each element integrates rigidly with the other with carefully engineered patented connections, which provide a simple means of assembling them into strong, durable, fireproof buildings, made of non-critical materials.

CEMENSTONE structures can be made and erected in shorter time from blueprints to completion, and at lower cost, than any other type of fireproof construction obtainable today.

Consult your architect, engineer, or contractor. Full details upon request.

* Reg. U. S. Trade Mark
Patents issued and pending.

For Example

A standard one-story building similar to the above, in any multiple of 20 feet in each direction, up to 12 feet high, is available promptly at all times at exceptionally low cost. A group of CEMENSTONE shapes is shown above.

★ ★

THE CEMENSTONE COMPANY

Neville Island Pittsburgh 25, Penna. FEderal 3346

cent rise. Average straight-time weekly hours, averaged 39.8 for journeymen, 40 for helpers and laborers.

A majority of journeymen had hourly rates ranging from $1.50 to $1.80, while a similar proportion of helpers and laborers were paid between $1.00 and $1.30. Among journeymen, bricklayers recorded the highest average rate, $1.814, and composition roofers the lowest, $1.465. The highest individual rate reported, $2.657, covered outdoor-advertising sign painters in New York City; the lowest rate noted, $0.500, covered building laborers in Charleston, S. C.

Union wage scales have been the subject of annual studies made by the Bureau of Labor Statistics since 1907. The original studies included 39 cities; the scope has been gradually increased so that current report covers 75 cities ranging in size from 40,000 to over 1,000,000. For many years data were collected as of May 15. The survey date was advanced to June 1 in 1939 and then to July 1 in 1942. The latest change was made to coincide with the effective date of the national agreement stabilizing wages in the contruction industry.

Average Union Hourly Wage Rates in the Building Trades, by Cities and Population Groups, July 1, 1945

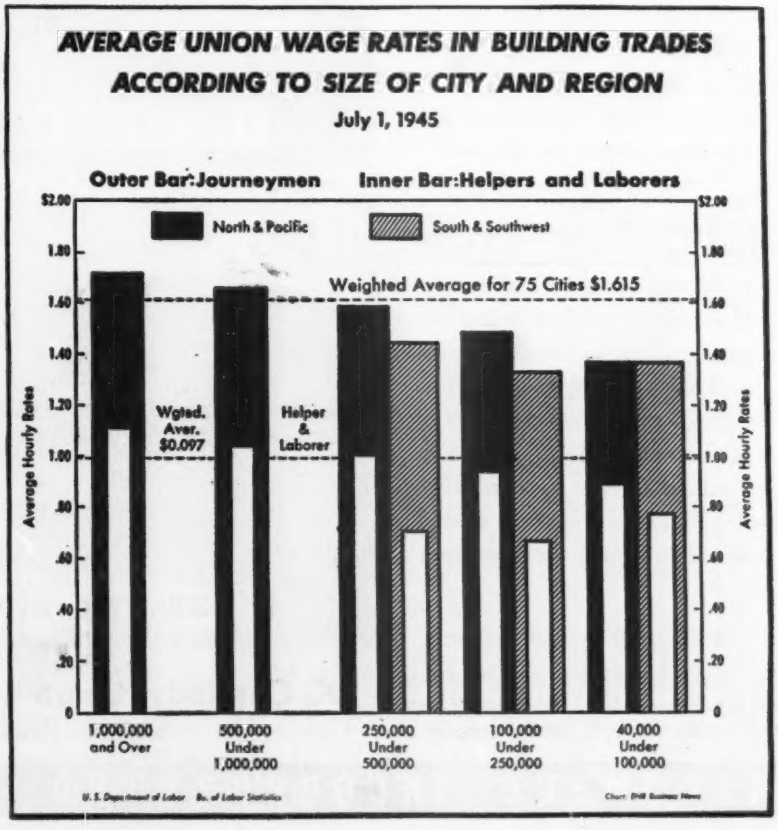
Population Groups — Cities in Each Population Group	Average Hourly Rate — Journeymen	Average Hourly Rate — Helpers and Laborers
I (over 1,000,000)		
New York	$1.893	$1.215
Chicago, Ill.	1.795	1.215
Average for Group I	**1.713**	**1.109**
Philadelphia, Pa.	1.632	.917
Detroit, Mich.	1.600	1.033
Los Angeles, Calif.	1.423	.995
II (500,000 to 1,000,000)		
Washington, D. C.	1.803	.931
Pittsburgh, Pa.	1.757	1.037
St. Louis, Mo.	1.697	1.056
Cleveland, Ohio	1.674	1.142
Buffalo, N. Y.	1.659	1.018
Average for group II	**1.651**	**1.035**
Boston, Mass.	1.595	1.028
San Francisco, Calif.	1.571	1.072
Baltimore, Md.	1.554	.885
Milwaukee, Wis.	1.454	1.043
III (250,000 to 500,000)		
Newark, N. J.	1.905	1.251
Toledo, Ohio	1.632	1.010
Cincinnati, Ohio	1.626	.951
Seattle, Wash.	1.621	1.172
Rochester, N. Y.	1.593	.997
Kansas City, Mo.	1.571	1.029
Denver, Colo.	1.549	1.066
Average for group III	**1.536**	**.901**
Louisville, Ky.	1.511	.837
Portland, Ore.	1.497	1.088
Columbus, Ohio	1.496	.857
Minneapolis, Minn.	1.496	.993
St. Paul, Minn.	1.496	.972
Indianapolis, Ind.	1.495	.942
Houston, Texas	1.463	.675
Birmingham, Ala.	1.439	.641
New Orleans, La.	1.412	.706
Memphis, Tenn.	1.411	.630
Providence, R. I.	1.406	.865
Dallas, Texas	1.398	.713
Atlanta, Ga.	1.362	.830
San Antonio, Texas	1.345	.713

Population Groups — Cities in Each Population Group	Average Hourly Rate — Journeymen	Average Hourly Rate — Helpers and Laborers
IV (100,000 to 250,000)		
Dayton, Ohio	$1.621	$ .965
Youngstown, Ohio	1.606	.854
Peoria, Ill.	1.564	1.008
South Bend, Ind.	1.542	1.086
New Haven, Conn.	1.525	.980
Springfield, Mass.	1.523	.983
Spokane, Wash.	1.512	1.047
Erie, Pa.	1.477	.886
Reading, Pa.	1.476	.846
Rock Island (Ill.) district*	1.466	.895
Oklahoma City, Okla.	1.452	.728
Average for group IV	**1.437**	**.884**
Des Moines, Iowa	1.425	.867
Grand Rapids, Mich.	1.418	.885
Worcester, Mass.	1.413	.942
Salt Lake City, Utah	1.406	.945
Omaha, Nebr.	1.405	.834
Scranton, Pa.	1.399	.893
Nashville, Tenn.	1.372	.614
Richmond, Va.	1.358	1.070
Duluth, Minn.	1.353	.823
Norfolk, Va.	1.340	.815
Wichita, Kansas	1.334	.816
Tampa, Fla.	1.291	.629
Jacksonville, Fla.	1.272	.610
Charlotte, N. C.	1.196	.....
V (40,000 to 100,000)		
Butte, Mont.	1.569	1.004
Charleston, W. Va.	1.566	.845
Mobile, Ala.	1.424	.685
El Paso, Texas	1.399	.750
Phoenix, Ariz.	1.395	.908
Binghamton, N. Y.	1.393	.855
Average for group V	**1.369**	**.799**
Little Rock, Ark.	1.331	.719
Madison, Wis.	1.306	.911
Manchester, N. H.	1.303	.770
Portland, Maine	1.251	.929
Jackson, Miss.	1.241	.....
Charleston, S. C.	1.224	.533
York, Pa.	1.216	.802

*Includes Rock Island and Moline, Ill., and Davenport, Iowa.

Average Hourly Wage Rates and Straight-Time Weekly Hours

Trade	Average Rate per Hour	Hours per Week
All building trades	**$1.512**	**39.8**
Journeymen	1.615	39.8
Asbestos workers	1.632	39.9
Boilermakers	1.750	40.0
Bricklayers	1.814	40.0
Carpenters	1.539	39.9
Cement finishers	1.546	40.0
Electricians, inside wiremen	1.754	40.0
Elevator constructors	1.742	40.0
Glaziers	1.547	39.3
Granite cutters	1.632	35.4
Lathers	1.729	39.3
Machinists	1.610	39.9
Marble setters	1.649	40.0
Mosaic and terrazzo workers	1.573	39.7
Painters	1.553	39.3
Paperhangers	1.505	39.9
Plasterers	1.737	39.5
Plumbers and gas fitters	1.747	39.4
Rodmen	1.588	40.0
Roofers, composition	1.465	40.0
Roofers, slate and tile	1.579	40.0
Sheet-metal workers	1.619	40.0
Sign painters	1.647	39.0
Steam and sprinkler fitters	1.709	40.0
Stonecutters	1.647	37.6
Stonemasons	1.753	39.0
Structural-iron workers	1.715	40.0
Tile layers	1.593	40.0
Helpers and laborers	.997	40.0
Bricklayers' tenders	1.086	39.9
Building laborers	.933	40.0
Composition roofers' helpers	.831	40.0
Elevator constructors' helpers	1.227	40.0
Marble setters' helpers	1.125	40.0
Plasterers' laborers	1.197	39.9
Plumbers' laborers	1.046	40.0
Steam and sprinkler fitters' helpers	1.084	40.0
Terrazzo workers' helpers	1.190	38.2
Tile layers' helpers	1.174	40.0



SPEED MODERN FIRE-SAFE CONSTRUCTION

WITH MACOMBER STEEL BUILDING PRODUCTS

ROOF TRUSSES AND PURLINS

● If you have a project that can be cleared under present building restrictions, investigate Macomber Steel Buildings. This type of construction uses steel columns or masonry walls with the roof construction shown opposite. Note the welded Bowstring Roof Trusses with Purlins carrying the deck and roofing materials.

THE STEEL FRAME GOES UP

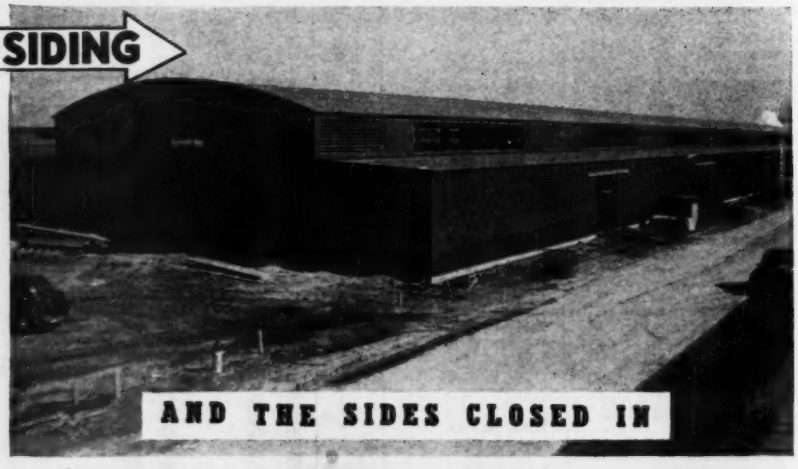
MACOMBER ROOF DECKING

● This Steel Decking is either welded or clipped to the Roof Purlins. The ribs are expanded at the ends to fit over adjoining roof plates. Erection is fast and the finished job is both economical and durable. This decking is made in lengths up to 12 feet, 2 inches and comes painted, complete with all closure and finishing plates, as required.

THE STEEL DECK IS ATTACHED

MACOMBER STEEL SIDING

● Shown opposite is a typical Macomber building using ribbed steel siding attached to the girts shown in top picture. This siding has a covering width of 21 inches and a maximum length of 12 feet, 2 inches. Catalogs giving complete design information sent upon request.



AND THE SIDES CLOSED IN

Catalogs indicated below:

The Steel Joist As a Structural Unit
Macomber All-Welded Roof Trusses
Macomber Ribbed Roof Decking

A Carefully Coordinated Service On The Entire Steel Structure

MACOMBER INCORPORATED · CANTON, OHIO

Index of Union Hourly Wage Rates in Each Building Trade (1939 = 100)

U. S. Bureau of Labor Statistics, Wage Analysis Branch

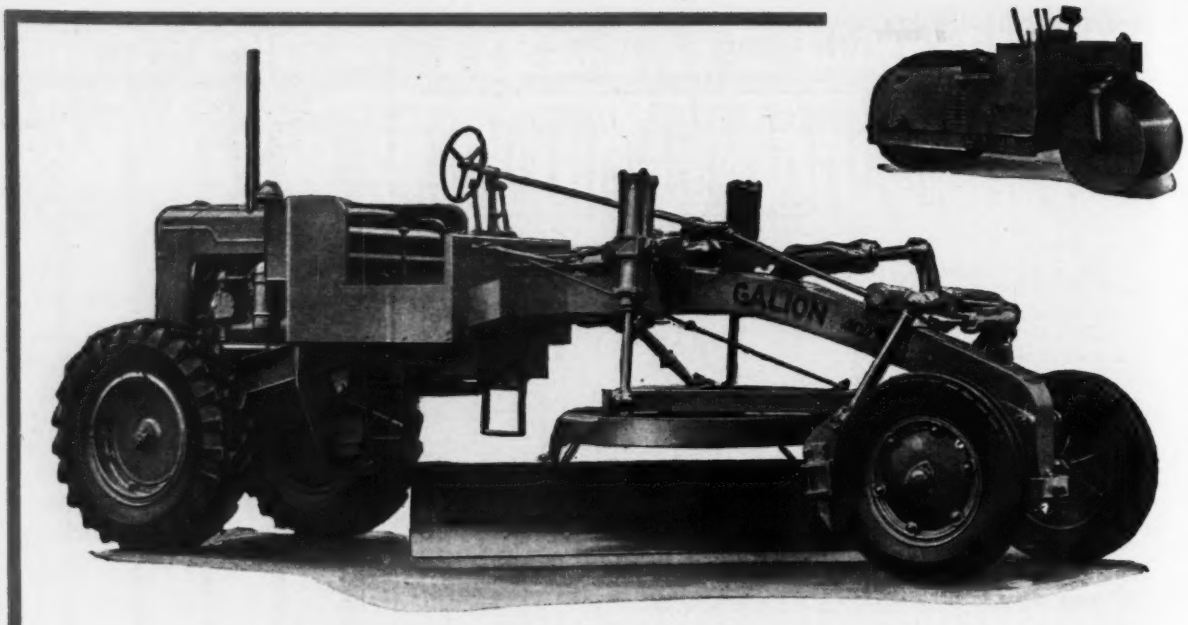
Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers	Hod Carriers
1907	29.3	29.7	27.3	37.7	29.8	34.5	27.9	.....	.....	26.2	37.3	33.3	30.6	30.1	33.9	27.9	30.8	30.3
1908	31.2	31.6	28.5	38.7	31.7	34.4	30.5	.....	.....	29.0	37.2	33.7	31.3	30.5	34.4	30.4	31.0	30.3
1909	32.7	33.2	29.5	39.5	33.5	35.5	31.5	.....	.....	31.0	37.5	34.2	31.4	34.7	34.5	32.6	31.1	30.4
1910	34.0	34.6	30.5	40.2	35.0	35.8	32.4	.....	.....	33.0	37.9	34.5	32.3	32.2	34.8	34.7	32.3	30.9
1911	34.5	35.2	30.6	40.2	35.5	37.2	32.8	.....	.....	33.6	38.1	36.5	33.3	33.2	35.2	35.5	32.4	31.2
1912	35.3	36.0	30.9	40.8	36.3	37.2	33.1	.....	33.8	34.0	38.9	36.7	34.1	33.8	35.5	36.1	32.7	31.4
1913	36.1	36.9	31.8	41.5	36.8	38.0	33.8	.....	34.6	35.5	39.3	37.9	35.6	35.0	36.7	37.3	34.2	31.8
1914	36.9	37.7	32.1	42.5	37.4	38.4	34.9	.....	35.2	36.7	39.4	38.4	36.9	35.7	37.8	38.0	34.5	32.2
1915	37.2	38.0	32.4	42.6	37.8	38.8	35.6	.....	35.7	36.9	39.6	38.7	37.4	36.5	38.2	38.0	34.7	32.4
1916	38.4	39.3	33.5	43.0	39.0	39.1	36.3	.....	36.7	40.3	41.0	39.0	38.0	37.2	38.8	38.6	36.3	33 4
1917	40.8	41.5	36.8	44.5	42 4	41.4	38.7	.....	38.1	41.5	42.2	40.4	39.7	38.6	40.2	40.9	40.1	37.2
1918	45.3	45.9	42.6	47.8	47.1	45.7	43.0	40.6	41.2	45.8	44.5	44.6	46.5	42.2	44.1	46.8	37.0	43.4
1919	51.9	52.4	49.3	53.0	54.2	41.2	49.3	43.4	45.8	53.6	51.3	50.4	51.3	47.4	49.5	52.7	53.3	50.8
1920	70.0	70.1	71.5	72.4	72.5	69.6	65.0	62.8	65.3	74.0	67.0	65.2	68.8	62.6	69.0	66.8	77.2	73.9
1921	71.3	71.4	72.2	71.9	73.1	71.9	67.3	63.9	66.3	75.1	70.7	68.2	71.3	63.4	70.0	68.1	77.6	74.2
1922	66.9	67.3	65.7	70.0	67.7	66.7	63.5	64.0	62.3	70.3	67.9	63.4	66.1	61.9	65.8	61.8	72.9	61.5
1923	73.9	74.2	69.7	79.2	75.5	73.0	65.9	67.9	68.8	77.1	75.7	70.0	71.2	65.0	77.8	65.9	74.3	67.2
1924	79.8	80.1	75.4	83.8	80.8	80.7	73.6	71.6	74.2	81.2	84.7	76.3	78.2	74.5	82.5	74.6	82.7	70.2
1925	82.9	83.1	77.9	88.7	82.5	81.1	77.4	79.6	80.9	85.7	86.1	77.9	80.8	78.4	84.1	75.4	79.0	78.4
1926	88.3	88.7	84.9	94.1	88.5	86.6	81.5	80.7	83.0	90.9	92.4	83.9	86.3	84.9	92.7	81.1	86.9	85.5
1927	91.3	91.7	86.4	96.4	91.4	90.4	84.9	86.2	86.3	93.9	94.4	85.6	88.9	87.3	93.9	86.8	87.2	87.5
1928	91.9	92.4	87.3	97.2	91.7	89.5	85.7	87.2	86.6	95.4	94.6	87.4	87.2	88.6	95.0	87.0	87.6	87.6
1929	93.1	93.6	88.8	99.4	93.2	89.5	89.3	88.5	85.9	95.2	93.5	88.1	90.6	89.1	97.7	87.7	88.9	91.4
1930	97.0	97.5	93.3	101.8	96.9	95.4	90.0	92.6	89.6	100.6	98.1	91.5	94.7	93.5	99.1	92.5	92.9	94.9
1931	97.3	97.8	92.8	101.6	97.1	95.8	92.1	93.2	89.1	101.0	97.9	92.6	96.2	94.0	99.6	93.4	91.5	94.6
1932	83.1	83.6	79.2	87.0	79.6	83.6	87.9	78.0	80.0	85.3	81.4	80.5	83.4	81.0	88.4	81.0	78.7	78.4
1933	80.8	81.4	75.7	84.7	79.4	81.6	80.3	77.9	77.1	83.6	78.2	79.8	81.0	78.6	82.5	80.1	74.1	77 4
1934	81.4	81.8	77.9	85.0	80.8	82.4	80.4	82.5	79.1	82.3	79.1	80.5	81.3	79.5	82.4	81.1	76.9	82.5
1935	82.3	82.8	78.3	83.7	81.8	82.9	84.3	83.3	80.0	82.6	80.0	81.8	81.9	80.8	82.2	81.8	78.0	79.9
1936	85.3	85.5	82.9	84.2	86.0	85.0	86.5	84.5	82.0	86.8	80.5	83.9	83.5	83.5	83.2	83.9	84.7	84.2
1937	91.2	91.4	90.1	90.1	91.6	91.2	90.3	92.6	87.5	93.0	88.7	88.5	89.6	88.1	91.9	91.6	92.7	90.6
1938	99.3	99.3	99.2	99.5	99.8	99.6	99.5	99.3	96.8	99.2	99.2	99.1	98.6	99.3	99.7	98.9	99.4	99.7
1939	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100 0	100.0	100.0	100.0	100.0	100.0	100.0
1940	101.6	101.4	102.0	102.2	102.5	100.9	101.7	101.4	100.7	100.2	100.5	101.6	101.8	100.3	99.5	100.4	101.6	103.8
1941	105.3	105.0	106.8	104.6	104.8	104.5	106.3	104.3	104.5	106.9	102.2	106.0	106.5	103.4	102.1	105.2	107.6	107.3
1942	111.9	110.9	117.5	108.3	112.1	110.8	113.5	108.8	109.1	110.5	105.0	110.5	116.0	109.3	108.0	108.7	119.6	115.7
1943	112.7	111.5	118.9	108.7	112.5	112.0	113.8	109.6	109.2	112.4	105.2	110.9	116.4	109.9	108.4	109.1	121.3	116.4
1944	113.6	112.4	120.3	110.0	113.4	113.1	114.7	110.2	110.0	113.5	105.9	111.5	117.2	110.5	108.0	109.8	122.9	117 4
1945	116.0	114.4	125.9	112.7	115.4	114.2	116.9	112.2	111.5	115.1	107.6	114.0	118.4	114.3	111.4	111.6	129.9	121.8

Index of Union Weekly Hours in Each Building Trade (1939 = 100)

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers	Hod Carriers
1907	124.3	123.8	126.1	122.9	121.0	122.7	124.2	.....	.....	131 1	125.8	120.6	117.0	120.3	118.4	121.3	121.6	118.9
1908	122.4	122.0	123.5	120.3	119.2	121.6	123.3	.....	.....	131.0	125.2	120.7	116.9	120.3	118.4	118.9	121.6	118.9
1909	120.7	120.5	121.0	117.8	117.8	112.5	122.5	.....	.....	129.2	125.2	120.7	116.9	120.0	118.4	117.3	121.2	118.5
1910	119.2	119.1	118.8	115.6	116.4	122.3	121.8	.....	.....	127.5	125.1	120.5	116.9	119.3	116.6	116.0	118.3	117.5
1911	118.8	118.7	118.6	115.1	115.8	121.1	121.6	.....	.....	126.7	125.8	120.2	116.6	119.2	115.8	115.8	118.3	116.9
1912	118.4	118.3	118.3	115.1	115.7	121.1	121.2	.....	121.8	126.6	124.3	119.2	115.1	118.4	115.8	114.6	118.3	116.0
1913	118.2	118.0	118.3	114.9	115.6	119.8	120.7	.....	121.8	125.9	124.3	119.2	114.9	118.0	115.7	114.1	118.3	116.0
1914	117.7	117.7	117.6	114.4	115.1	119.0	120.3	.....	121.8	125.6	125.2	118.8	114.8	116.5	115.7	113.9	117.9	114.5
1915	117.6	117.6	117.5	114.3	115 1	119.0	119.6	.....	121.2	125.6	123.6	118.8	114.6	116.5	115.6	113.9	117.9	114.5
1916	117.2	117.1	117.2	114.1	115.1	117.2	118.6	.....	121.2	124.7	122.3	118.2	114.1	116.1	115.4	113.6	117.3	114.5
1917	116.9	116.9	116.7	113.7	115.1	115.9	118.1	.....	120.6	124.6	122.2	118.1	114.0	116.0	115.3	113.4	116.0	114.4
1918	116.3	116.2	116.3	113.7	113.9	115.3	117.3	118.0	120.6	124.0	121.9	117.1	112.8	114.9	115.3	113.0	115.5	114.4
1919	115.7	115.7	115.2	113.5	113.2	114.4	116.3	118.0	120.3	123.8	121.9	116.7	112.3	114.8	114.6	112.8	113.3	114.0
1920	115.1	115.2	114.8	113.4	113.3	113.8	116.0	117.5	119.6	120.2	121.6	116.7	111.9	114.7	114.6	112.8	112.1	113 8
1921	115.0	115.1	114.5	113.4	113.2	113.8	116.0	118.0	119.3	120.3	121.3	116.5	111.9	114.6	114.7	112.8	112.1	113.8
1922	115.0	115.2	114.2	113.4	113.3	113.7	116.0	118.1	119.4	121.2	121.4	116.5	111.8	114.6	114.6	112.8	111.3	114.0
1923	115.1	115.3	114.4	113.4	113.7	113.7	116.0	117.5	119.8	120.9	122.0	116.5	111.8	114.6	114.6	112.8	112.1	114.0
1924	115.1	115.3	114.4	113.3	113.5	113.7	115.9	117.5	119.6	120.8	122.1	116.5	111.8	114.6	114.3	112.8	111.8	113.9
1925	115.1	115.3	114.2	113.2	113.5	113.4	115.9	117.1	119.2	121.1	121.7	116.5	111.8	114.6	114.3	112.5	111.9	113.8
1926	114.9	115.1	113.9	113.3	113.5	113.4	115.9	116.5	118.9	120.7	118.2	116.5	111.8	114.4	114.5	112.8	112.1	113.9
1927	114.7	114.8	113.9	112.7	113.5	113.0	115.9	117.9	118.3	120.2	117.7	116.2	111.4	114.2	114.3	112.8	112.3	113.9
1928	114.0	114.0	113.8	112.7	112.9	112.4	115.3	117.4	117.7	117.0	116.7	116.2	111.1	114.2	114.2	112.7	112.2	113.9
1929	113.0	113.3	111.5	109.8	112.9	112.5	112.6	116.1	117.1	116.7	115.6	115.2	111.0	113.6	110.9	112.2	112.1	107.6
1930	109.8	110.0	109.0	107.1	109.4	108.1	109.9	112.4	110.4	115.1	113.0	109.9	106.9	108.5	107.1	108.8	110.0	106.9
1931	108.5	108.5	108.1	105.5	107.7	106.9	108.8	110.5	109.8	114 4	112.1	108.4	105.1	107.4	105.2	107.5	108.7	106.3
1932	106.5	106.6	105.7	103.1	105.0	105.6	106.2	107.9	109.3	114.2	110.0	108.0	103.6	106.4	104.8	104.8	104.9	104.0
1933	106.2	106.2	105.2	104.2	103.4	107.6	106.2	107.9	108.8	114.0	112.4	107.5	103.5	105.8	104.0	104.5	104.3	103.4
1934	102.3	102.3	101.9	102.4	102.5	103.7	99.9	102.3	102.5	99.9	107.6	106.5	102.0	105 1	103.5	103.0	99.9	101.5
1935	101.5	101.5	101.2	102.3	102.0	103.5	95.8	101.6	102.3	99.8	105.9	105.8	102.1	104.8	103.4	101.8	99.8	101.4
1936	101.5	101.5	101.4	02.3	102.1	103.0	96.2	102.0	101.3	100.2	104.2	104.4	102.0	105.0	103.4	101.7	100.3	101.2
1937	101.9	101.9	101.8	103.3	101.9	103.1	100.9	102.1	102.7	100.2	104.3	105.0	102.1	105.1	103.4	101.2	100.6	101.5
1938	100.2	100.1	100.2	100.0	100.0	100.0	100.3	100.2	100.8	110.4	100.0	99.7	100.0	99.6	100.0	100.1	100.1	100.3
1939	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1940	99.9	100.0	99.4	99.7	100.0	100.2	100.0	100.0	99.8	100.5	99.2	99.0	100.0	100.0	99.9	100.0	99.4	99.9
1941	100.3	100.5	99.7	99.9	100.6	100.7	100.6	100.6	100.7	100.7	100.0	99.4	100.8	100.6	100.0	100.4	99.7	99.8
1942	101.1	101.8	98.8	100.8	100.8	100.6	104.6	102.0	102.5	106.5	102.0	99.9	100.9	102.2	100.2	101.1	98.8	98.6
1943	101.0	102.0	98.1	100.8	100.8	100.6	104.6	102.0	103.4	106.5	106.0	101.8	100.9	102.2	100.2	101.1	97.4	98.4
1944	101.2	102.2	98.1	100.8	101.1	100.6	104.6	102.0	103.6	106.8	106.1	101.8	100.9	102.2	100.2	101.1	97.4	98.4
1945	101.2	102.2	98.1	100.8	101.1	100.6	104.6	102.0	103.6	106.8	106.1	101.8	100.9	102.2	100.2	101.1	97.4	98.4

Wage Rates per Hour
New York City

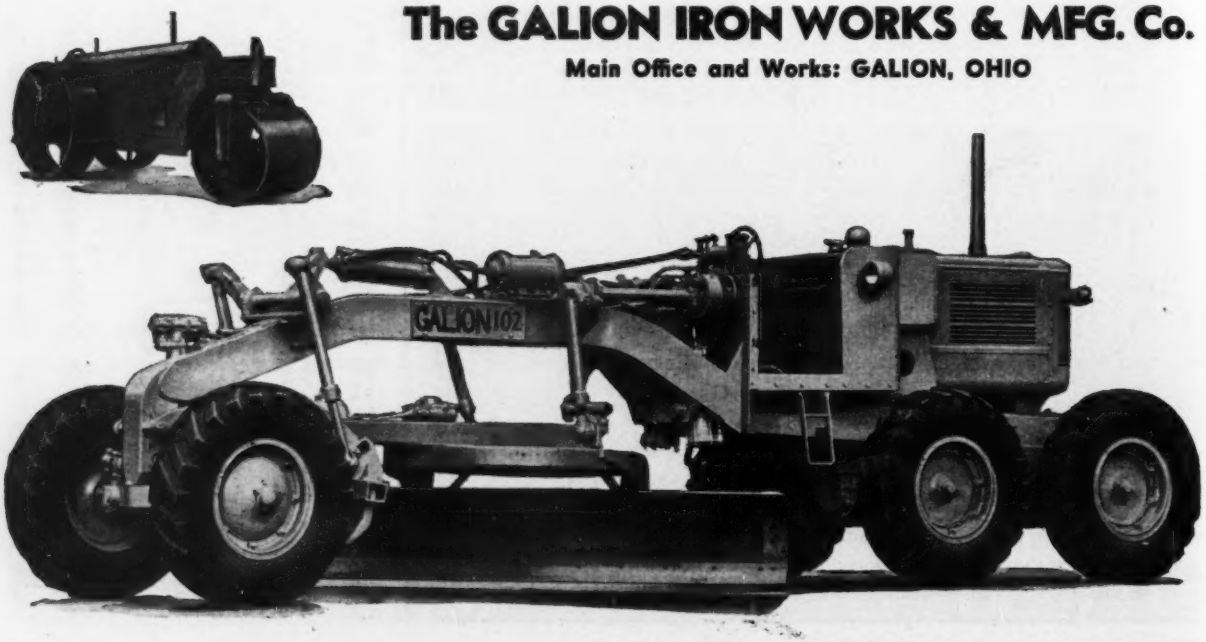
	Carpenters, 10 Hr. Day	Bricklayers, 8 Hr. Day	Masons' Laborers, 8 Hr. Day	Common Laborers, 10 Hr. Day	Structural Iron-Workers
1874	$0.23	$0.43	$0.18	$0.14	.....
1875	.22½	.37	.18	.14	.....
1876	.21	.31	.17	.14	.....
1877	.20	.31	.15	.12	.....
1878	.18	.31	.15	.11	.....
1879	.17	.31	.16	.11	.....
1880	.18	.34	.18	.12	.....
1881	.19	.46	.21	.13	.....
1882	.21	.50	.22	.15	.....
1883	.21	.50	.23	.13	.....
1884	.21	.50	.22	.13	.....
1885	.20	.50	.22	.13	.....
1886	.21	.50	.23	.13	.....
1887	.21	.50	.20	.14	.....
1888	.22	.50	.16	.12	.....
1889	.22	.50	.23	.13	.....
	8 Hr. Day			9 Hr. Day	
1890	.43	.47	.28	.14	.....
1891	.43	.47	.28	.14	.....
1892	.44	.50	.29	.14	.....
1893	.43	.50	.30	.14	.....
1894	.44	.50	.30	.14	.....
1895	.43	.50	.30	.14	.....
1896	.44	.50	.30	.14	.....
1897	.44	.50	.29	.14	.....
1898	.44	.50	.30	.14	.....
1899	.45	.55	.33	.14	.....
1900	.50	.56	.33	.14	.....
1901	.50	.59	.33	.19	.....
1902	.51	.65	.36	.17	.....
1903	.56	.65	.36	.16	.....
1904	.53	.65	.36	.19	.....
1905	.54	.70	.36	.20	.....
1906	.58	.70	.38	.21	.....
				—8 Hr. Day—	
1907	.62½	.70	.37½	.22	$0.60
1908	.62½	.70	.37½	.22	.60
1909	.62½	.70	.37½	.22	.60
1910	.62½	.70	.37½	.22	.62½
1911	.62½	.70	.37½	.22	.62½
1912	.62½	.70	.37½	.23	.62½
1913	.62½	.70	.37½	.22½	.62½
1914	.62½	.75	.37½	.22½	.62½
1915	.62½	.75	.37½	.25	.62½
1916	.62½	.75	.37½	.25	.66
1917	.69	.75	.42½	.30	.68
1918	.69	.81	.47	.40½	.80
1919	.75	.87½	.57½	.40½	.87½
1920	1.12½	1.25	.77½	.75	1.12½
1921	1.12½	1.25	.87½	.60	1.12½
1922	1.12½	1.25	.87½	.60	1.12½
1923	1.12½	1.50	.95	.61½	1.12½
1924	1.31½	1.50	1.00	.68½	1.39
1925	1.31½	1.50	1.00	.65½	1.46½
1926	1.45	1.64½	1.07	.81½	1.60
1927	1.50	1.75	1.12½	.90½	1.75
1928	1.50	1.75	1.12½	.90½	1.75
1929	1.55	1.84	1.15	.98½	1.81
1930	1.65	1.92½	1.03½	1.03½	1.92½
1931	1.45	1.71½	1.02½	.65½	1.92½
1932	1.33	1.47	1.00	.64½	1.67½
1933	1.37½	1.57½	.91	.72½	1.65
1934	1.40	1.53	.82½	.84½	1.62
1935	1.40	1.50	.82½	.68	1.65
1936	1.40	1.50	.82½	.65	1.58
1937	1.60	1.73	.91	.76	1.79
	—7 Hr. Day—				
1938	1.75	1.88½	.99½	.91½	1.93½
1939	1.75	1.89½	1.03½	.91½	1.93½
1940	1.81	1.96	1.03½	.91½	1.96½
1941	1.85	2.00	1.03½	.93¾	2.00
1942	1.85	2.00	1.03½	.95	2.00
1943	1.85	2.00	1.03½	.95	2.00
1944	1.85	2.00	1.0835	.954	2.00
1945	1.85	2.00	1.10	1.06	2.00
			1944 by months		
Jan.	1.85	2.00	1.03½	.95	2.00
Feb.	1.85	2.00	1.03½	.95	2.00
Mar.	1.85	2.00	1.10	.95	2.00
Apr.	1.85	2.00	1.10	.95	2.00
May	1.85	2.00	1.10	.95	2.00
June	1.85	2.00	1.10	.95	2.00
July	1.85	2.00	1.10	.95	2.00
Aug.	1.85	2.00	1.10	.95	2.00
Sept.	1.85	2.00	1.10	.95	2.00
Oct.	1.85	2.00	1.10	.95	2.00
Nov.	1.85	2.00	1.10	.95	2.00
Dec.	1.85	2.00	1.10	1.00	2.00
			1945 by months		
Jan.	1.85	2.00	1.10	1.00	2.00
Feb.	1.85	2.00	1.10	1.00	2.00
Mar.	1.85	2.00	1.10	1.00	2.00
April	1.85	2.00	1.10	1.00	2.00
May	1.85	2.00	1.10	1.00	2.00
June	1.85	2.00	1.10	1.10	2.00
July	1.85	2.00	1.10	1.10	2.00
Aug.	1.85	2.00	1.10	1.10	2.00
Sept.	1.85	2.00	1.10	1.10	2.00
Oct.	1.85	2.00	1.10	1.10	2.00
Nov.	1.85	2.00	1.10	1.10	2.00
Dec.	1.85	2.00	1.10	1.10	2.00
			1946 by months		
Jan.	2.10	2.25	1.20	1.20	2.25
Feb.	2.10	2.25	1.20	1.20	2.25
Mar.	2.10	2.25	1.20	1.20	2.25
Apr.	2.10	2.25	1.20	1.20	2.25



We like nice weather for then Galion motor graders and rollers take to the road. This year they are going to be busier than ever with all the activity in street, road and airport construction work in the offing. Galion rollers and graders are eager to get started . . . will provide 'tops in performance' on many of these jobs where efficient operation and speed are in demand. It might as well be Spring . . . it might as well be a Galion. What do you think?

GRADERS
ROLLERS

The GALION IRON WORKS & MFG. Co.
Main Office and Works: GALION, OHIO



Depreciation Schedule—U. S. Bureau of Internal Revenue

In January 1942 the U. S. Bureau of Internal Revenue revised its 1931 schedule of probable useful life and depreciation rates. Items of direct interest to civil engineers and contractors are shown in revised Schedule "F", and include those quoted in the following list. The schedule reveals the probable useful life in years. Annual depreciation rates are not given, inasmuch as they are considered to be on a straight-line basis. For example, on an item having a probable useful life of ten years, the annual depreciation rate is 10 percent; for an item having a probable useful life of 25 years, the annual depreciation rate is 4 percent, etc.

BUILDINGS	BUILDING ONLY	BUILDING & BLDG. EQUIPMENT		
	Est. Total Life, Years	Composite rate (percent) Type of construction		
		Good	Average	Cheap
Apartments	50	2½	2½	3
Banks	67	2	2	2½
Dwellings	60	2	2½	3
Factories	50	2½	2½	3
Farm buildings	60	2	2	2½
Garages	60	2	2½	3
Grain elevators	75	1½	2	2½
Hotels	50	2½	2½	3
Loft buildings	67	2	2	3
Machine shops	60	2	2½	3
Office buildings	67	2	2½	3
Stores	67	2	2	2½
Theaters	50	2½	3	3½
Warehouses	75	1½	2	2½

BUILDING EQUIPMENT

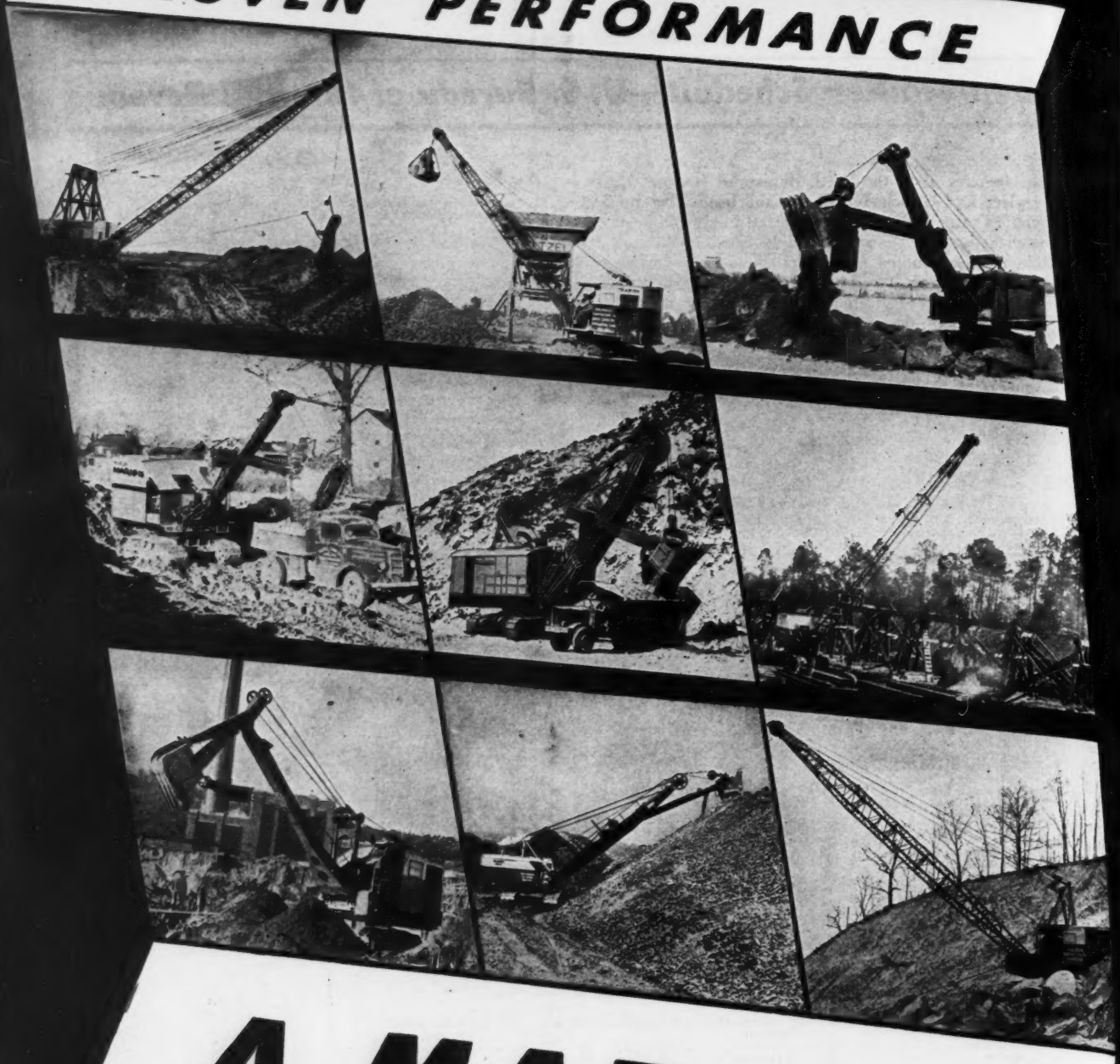
	Years
Air conditioning:	
Air conditioning systems—	
Large—over 20 tons	20
Medium—5 to 15 tons	15
Small—under 5 tons	10
Air washer. (See Dehumidifier.)	
Compressors—	
Refrigerating	20
Air for pneumatic controls	20
Condensers—	
Shell and tube	20
Double pipe	20
Evaporation	15
Coolers, water—tank and coil or shell and tube	20
Dehumidifier	10
Drums, purge or surge	20
Ducts and other sheet metal work.*	
Fans	15
Filters, air, oil, self-cleaning	20
Dry cleanable	10
Gauges	15
Grilles and registers—	
Anemostats	20
Grilles and registers—	
Wall type	20
Ceiling	20
Window units	15
Plaques	20
Santrols.*	
Heaters—	
Boiler, oil burner and tank	20
Booster heaters	20
Electric heaters	15
Finned tube heaters, steam water cleanable tube	20
Preheaters and reheaters	20
Water heaters, open or closed type	20
Insulation—	
Cork, cold pipes and tanks	20
Magnesia, hot pipes	15
Wool felt	20
Asbestos	15
Louvres and screens, fresh air—	
Copper	25
Steel	15
Manometers	15
Motors—	
Synchronous and exciter set	20
Induction, indoor	20
Induction, weatherproof for outdoor	20
Piping, refrigerant and other	20
Pumps—	
Chilled water	20
Condenser water	20
Condensate	20
Dehumidifier	22
Evaporative condenser	15
Sump	25
Well	25
Receivers, refrigerant	25
Regulators, suction or static pressure	5
Silicia gel beds	15
Spray pond	15
Switchboard, electric panel	20
Thermometers, room type or recording	15
Tower, cooling	15
Valves—	
Relief	20
Automatic expansion and by-pass	5
Solenoid	15
Water regulating	20
Ammeters	15
Clocks	15
Clocks, watchman	15
Compressors, air and vacuum	20
Electric clock systems:	
Clocks, time	20
Conduits, fittings and wiring. (See lighting systems)	
Motors and generators	20
Switch equipment—	
Boxes.*	
Switch parts	20
Elevators:	
Freight	25
Passenger	20
Fire equipment:	
Fire alarm systems	25
Movable equipment	20
Sprinkler system.*	
Guards, machine	25
Heaters, electric	10
Heaters, gas	15
Heating systems:	
Boilers and furnaces	20
Burner equipment—	
Gas	16
Oil	10
Radiators	25
Lighting systems:	
Conduits and fittings.*	
Wiring	20
Fixtures	15
Miscellaneous facilities:	
Awnings	5
Doors, louvre, ventilating	15
Incinerators	14
Safes and vaults.*	
Screens, window	10
Shades	5
Venetian blinds	8
Plumbing:	
Faucets and flushing valves	15
Bath tubs, lavatories, toilet bowls, etc.	25
Pipes—	
Brass or copper.*	
Iron, cold-water	25
Iron, hot-water or steam	20
Sewer, cast-iron or vitrified.*	
Plumbing: (cont'd)	Years
Valves—	
Brass body, water or steam.*	
Iron body, water or steam	20
Pumps:	
Suction, pressure and sump	13
Roofs:	
Asbestos	25
Asphalt and tar (prepared)	15
Galvanized iron—	
Light or cold dipped	15
Heavy or hot dipped	20
Tar and gravel (5-ply)	20
Tarred felt	10
Copper, slate, tile, tin.*	
Starters, electric	20
Switchboards, electric	25
Tanks and vats, water:	
Metal	25
Wood	15
Telephone equipment:	
Conduits and fitting.*	
Wiring and fixtures	20
Tools, small, miscellaneous	5
Transformers	25
Trucks, conveyance (within building)	10
Trucks, lift	15
Voltmeters	15
Welfare equipment:	
Athletic	10
Cafeteria	10
Hospital and first aid	10
Police and fire	10
Wells and well pumps	25

*Life of building.

CONSTRUCTION EQUIPMENT

	Years
Automobiles:	
Light	2
Medium	3
Heavy	5
Backfillers, power:	
Light	3
Medium	5
Heavy	6
Tractor	5
Barges:	
Steel	30
Wood	25
Batcher plants:	
All steel, demountable	10
Steel frame, wood bin	10
Stationery	14
Wood frame and wood bin	7
Batch, measuring devices	4
Benders, bar	5
Bending blocks	10
Bending machines:	
Angle	15
Pipe	10
Rail	10
Bins:	
Steel, concrete	6
Steel	12
Wood	8
Bin frames, steel	6
Blacksmith shop outfits, portable	4
Blocks, pulley, differential	6
Blowers, mechanical	10
Boats:	
House	20
Motor	8
Boilers:	
Upright	7
Locomotive	15
Stationary	20
Borers (wood), portable	3
Boring apparatus, test	10
Boxes, mortar and batch	3
Brakes:	
Bending	10
Cornice (sheet metal)	22
Breakers, pavement, pneumatic	3
Buckets:	
Cableway	6
Clamshell	6
Concrete	5
Elevator	5
Orange peel	6
Bail, pivot turnover	5
Scraper or drag line	6
Buggies:	
Concrete	3
Timber	2
Building, job office or storage. (Life of job)	
Bulldozers:	
Gradebuilders	8
Tractor	4
Bunkers, stone portable, with screens	6
Burner equipment, gas and oil	12
Cables, wire	4
Cableways, cable only	3
Cableway carriage	5
Camping equipment	3
Capstans, electric	10
Cars:	
Ballast spreader	10
Batch box, steel	5
Boarding and tool	20
Concrete	8
Derrick, bridge	10
Dump, steel	8
Dump, wood	6
Flat, steel	12
Flat, wood	10
Hand	10
Hopper	10
Scale	10
Skip hoist	10
Tank	20
Carts, concrete	3
Carts, tool (steel)	4
Cement gun machines	4
Chains:	
Hawsers and lines	6
Power, transmission	5
Channelers, rock	6
Chipping and calking tools, pneumatic	3
Chutes, concrete, gravity	2
Clamps, column form	5
Cleaning machine for exterior of building, steam or sand	15
Compressors:	
Belt driven	10
Electric, portable	8
Gasoline, portable	6
Motor-truck unit	5
Steam portable	6
Concrete machines, pneumatic	5
Concrete mixers:	
Electric	5
Gasoline, 3½s, 5s, 7s	3
Gasoline, 10s, 14s	4
Gasoline, 21s, 28s	5
Paving, gas	8
Paving, steam	8
Steam	8
Truck mounted	5
Controllers, motor	12
Conveyors:	
Belt, elevating—	
Portable	3
Stationary	6
Bucket	6
Cable—	
Drag	6
Monorail	15
Chain, portable	6
Portable	5
Scraper	6
Cranes:	
Bridge and cantilever	20
Crawler—	
Electric—	
2½, 5 tons	5
10, 15 tons	7
20 tons and over	9
Gas—	
2½, 5 tons	5
10, 15 tons	9
20 tons and over	12
Locomotive gas	7
Steam—	
2½, 5 tons	6
10, 15 tons	10
20 tons and over	12
Locomotive	10
Dock or wharf, traveling	20
Dragline	10
Universal (gas, 2½ to 5 ton), mounted on 10-ton truck	6
Craneways:	
Steel	15
Wood	10
Crushers, rock:	
Portable	8
Stationary	10
Cutters:	
Bar, power	5
Corrugated iron, hand	10
Cutting and welding outfits, portable	4
Davits	15
Derricks:	
Boat	10
Circle swing, hand	8
Crab—	
Hand	16
Power	10
Guy—	
Steel	12
Wood	8
Stiffleg—	
Steel	12
Wood	8
Diggers, clay, pneumatic	3
Drag lines:	
Electric—	
½, ¾ cubic yard	6
1, 1½, and 1¾ cubic yards	8
2 cubic yards and over	10

PROVEN PERFORMANCE



A MARION
For Every Material Handling Job

From 3/4 cu. yd. to 40 cu. yds.

WHAT IS YOUR MATERIAL HANDLING PROBLEM?

MARION POWER SHOVEL COMPANY

MARION, OHIO, U.S.A.

Note: Formerly the Marion Steam Shovel Company—Established 1884. Offices and Warehouses in principal cities

Drag Lines: (cont'd)	Years
Gasoline—	
½, ¾ cubic yard	5
1, 1½ and 1¼ cubic yard	9
2 cubic yards and over	12
Steam—	
½, ¾ cubic yard	6
1, 1½ and 1¼ cubic yards	10
2 cubic yards and over	12
Dredges:	
Clamshell	16
Dipper	8
Hydraulic	20
Pipe	10
Drill boats	12
Drill points, well	5
Drills:	
Airdrifter	3
Electric or pneumatic, hand, for wood or metal	5
Hand, electric	3
Rock, electric	3
Jackhammer	3
Steam	5
Traction, well	7
Tripod	7
Tunnel carriage	5
Well	10
Drums for oil (steel)	10
Elevators:	
Bucket, stationary	6
Cage (steel tower)	5
Engines:	
Blowing	12
Fire	7
Gas	10
Marine	20
Oil	20
Plumbing	14
Steam	11
Excavators:	
Cableway, complete	4
Trench, gasoline—	
7-foot depth	6
12-foot depth	6
18-foot depth	8
Trench, steam—	
7-foot depth	8
12-foot depth	8
18-foot depth	10
Trench, vertical boom	5
Wheel or ladder type	5
Extinguishers, fire	3
Fans, exhaust	15
Finishing machines	4
Floats, bridge (steel)	5
Forges, gas or oil burning	10
Forms:	
Concrete (metal pans)	5
Concrete, supports, adjustable	4
Steel, for—	
Pavements	4
Pipes	3
Roads	4
Tunnels and conduits	4
Walls	5
Furnaces, metal melting:	
Coal fired	10
Electric	12
Gas or oil	7
Generator sets:	
Steam engine	12
Turbine, headlight or floodlight	4
Gin poles (steel)	10
Gradebuilders (bulldozers)	8
Graders:	
Blade, road—	
7, 8 foot blade	4
9, 10 foot blade	5
over 10-foot blade	8
Elevating	8
Form, subgrade planers	6
Rooters, wheel	5
Grinders:	
Metal surface	15
Saw filers and setters	14
Surface, concrete	4
Hammers:	
Electric	3
Pneumatic riveting	3
Harness	4
Heaters, asphalt, tar, and pitch kettles	4
Helmets, gas and diving suits and equipment	10
Hoists:	
Air, electric, or steam	8
Chain	6
Electric monorail or post	5
Gas	6
Hand power	8
Slew—	
Electric	8
Steam	12
Holders on pneumatic	4
Horses	5
Hose:	
Fire, linen or rubber lined cotton	5
Metal, flexible	10
Oil	5
Reel or cart	10
Rubber, air, steam or water	10
Inundators, batch	4
Inland craft:	
Graders, hydraulic	7
Quarter boats	10
Jacks:	
Hydraulic	8
Rail	25
Ratchet	8

Jacks: (cont'd)	Years
Screw	5
Steamboat, push and pull	3
Jibs, steam	17
Jointers, bench, electric, steam or gas	5
Ladders:	
Rope, wood rungs	2
Steel	3
Ladles, metal	7
Lathes:	
Metal working	15
Woodworking	17
Launches, gasoline	10
Levee construction equipment:	
Drag lines	8
Shovels	8
Tower excavators	12
Life-saving equipment	10
Light plant	4
Lighters	22
Loaders, bucket:	
Crawler	5
Portable	5
Stationary	6
Locomotive battery	4
Locomotives, industrial:	
Diesel	10
Electric	16
Gas—	
Up to 10 tons	8
10 to 20 tons	15
Over 20 tons	20
Steam—	
Up to 10 tons	8
10 to 20 tons	18
Over 20 tons	20
Locomotives, standard gage	30
Magnets, lifting	15
Milling machines	15
Mixers: portable mortar	3
Less than ½ cubic yard	6
Over ½ cubic yard	8
Caterpillar	8
Motors:	
AC and DC—	
Large	12
Medium	10
Small	8
Hydraulic	5
Pneumatic	5
Mowers, right of way	5
Mules	5
Pile drivers:	
Barge	8
Railroad outfits	10
Steam, on skids	10
Track	12
Pile hammers, steam or air:	
Heavy	10
Light	4
Medium	5
Pipe:	
Black or galvanized	4
Wood	5
Wood and steel combination	6
Pipe lines and fittings, for floating dredges	10
Pit and quarry plants	6
Planers:	
Metalworking	15
Woodworking	20
Plows:	
Furrow	3
Rooter	6
Pontoons	20
Presses, drill	12
Pumping units:	
Electric—	
Centrifugal	6
Diaphragm	6
Piston	6
Gas—	
Centrifugal	6
Diaphragm	6
Highway contractor's pump	4
Piston	5
Steam, centrifugal	10
Pumps:	
Air lift	10
Centrifugal	6
Humdinger	6
Impulse	6
Hydraulic	15
Oil	10
Steam piston unit	6
Testing for pipe lines	15
Punches, hydraulic	20
Punches for steel, power	15
Racks, storage, for pipe and steel:	
Steel	20
Wood	15
Rails, steel	10
Raising equipment, for buildings	8
Reamers:	
Electric	3
Pneumatic	3
Riveters, pneumatic	5
Rollers:	
Concrete finishing (steel)	10
Road, gas	10
Road, steam	10
Rolls, ridge	5
Rowboats	6
Sand-blast outfits	10
Sawmills, portable	10
Saws:	
Band, cut-off and rip, power	10
Hand, Electric and pneumatic	3

Saws and woodworkers:	Years
Steel frames	10
Wood frames	5
Scales, large, track and wagon	20
Scarifiers:	
Attachments	4
Blocks, steerable	5
Drag, all steel	4
Grader type	4
Scows	25
Scows, dump	25
Scrapers:	
Blade, carryall	6
Fresno or Morman	2
Rotary	4
Slip	2
Wheel	5
Screens and bunkers, for gravel pits only	5
Screens, revolving	6
Sharpeners, drill	8
Shears, for steel, hand	10
Shores, adjustable	4
Shovel attachments, for cranes	6
Shovels:	
Electric or gasoline, crawler or Wheel—	
½, ¾ cubic yard	5
1, 1¼, 1½ cubic yards	6
2 cubic yards and over	8
Steam, crawler or wheel—	
½, ¾ cubic yard	7
1, 1¼, 1½ cubic yard	8
2 cubic yards and over	10
Railroad, steam	10
Tunnel	4
Spouting plants, complete, concrete	4
Spraying equipment, paint	12
Spreaders, stone:	
Hopper wagon	5
Steel box	5
Steamers, paddle wheel	30
Switches:	
Portable	4
Stationary	5
Tampers, backfill, pneumatic	3
Tamping machines	10
Tanks:	
Gasoline, storage	6
Relay	6
Water or air, storage (steel)	10
Water storage (wood)	14
Tarpaulins and tents	3
Threading and cutting machines, pipe	10
Ties:	
Steel	12
Wood	6
Tongs, chain	4
Towers:	
Cableway—	
Steel	6
Wood	3
Steel boom with counterweights	5
Tracks, industrial, portable	6
Tractors:	
Electric—	
3-ton	3
5-ton	5
10-ton	6
20-ton	8
Gas or steam—	
3-ton	4
5-ton	6
10-ton	8
20-ton	10
Trailers:	
Dump—	
Steel	10
Wood	10
Platform, wood	4
Drop platform, heavy duty	5
Transformers, car	10
Trenching machines. (See Excavators.)	
Trucks, auto:	
General purpose or dump—	
½-1 cubic yard	3
1-1½ cubic yards	5
2 cubic yards and over	8
Tugs, screw-propelled, steam or gas	25
Turntables, industrial railway	4
Vises	5
Wagons:	
Dump—	
Steel	6
Wood	6
Farm—	
Heavy	10
Light	10
Road oilers, tank, steel	10
Tank or sprinkler—	
Steel	10
Wood	8
Washers, gravel	3
Welding outfits, acetylene or electric	10
Wheelbarrows	2
Winches, electric and pneumatic	10
Wire and cables:	
Electric	6
Flexible, steel armored	8

BRIDGES

Concrete and steel or masonry, large	100
Concrete and steel or masonry, small	75
Steel, heavy	50
Steel, light	40

WATER SUPPLY

	Years
Impounding dams	150
Springs and wells	100
Infiltration galleries and tunnels	100
Collection conduits and reservoirs	75
Mains, cast iron:	
4-inch and less	50
6-inch	65
8 to 10-inch	75
12-inch and over	100
Settling basins	50
Coagulating basins	50
Filters	50
Steam engines	30
Internal combustion engines (Diesel type)	25
Pumps	50
Stand pipes	50
Meters	30
Hydrants	50
General office equipment	19
General shop equipment	20
General store equipment	20
Laboratory equipment	16

ELECTRIC UTILITIES

Steam Production

	Years
Structures and improvements	50
Boiler plant equipment	28
Engines and engine driven generators	30
Turbo-generator units	30
Accessory electric equipment	28
Miscellaneous power plant equipment	28

Hydraulic Production

Structures and improvements	75
Reservoirs, dams and waterways	150
Waterwheels, turbines and generators	35
Accessory electric equipment	35
Miscellaneous power plant equipment	35
Roads, railroads and bridges	100

Transmission Plant

Structures and improvements	45
Station equipment	28
Towers and fixtures	50
Poles and fixtures	33
Overhead conductors and devices	50
Underground conduit	75
Underground conductors and devices	40
Roads and trails	60

Distribution Plant

Structures and improvements	45
Station equipment	28
Storage battery equipment	20
Poles, towers and fixtures	35
Overhead conductors and devices	33
Underground conduit	60
Underground conductors and devices	40
Line transformers	28
Services	28
Meters	28
Installations on customers' premises	25
Street lighting and signal systems	22

ARTIFICIAL GAS

Production Plant

	Years
Structures and improvements	50
Boiler plant equipment	30
Other power equipment	40
Benches and retorts	35
Coke ovens	35
Producer gas equipment	33
Water gas generating equipment	33
Petroleum gas equipment	33
Other gas generating equipment	33
Coal, coke, and ash handling equipment	40
Gas reforming equipment	33
Purification equipment	33
Residual refining equipment	40
Other production equipment	33

Distribution Plant

Structures and improvements	45
Mains	80
Cast iron pipe—	
4 inches and less	50
6 inches	65
8 to 10 inches	75
12 inches and over	100
Steel pipe—	
4 inches and less	30
5 to 7 inches	40
8 inches and over	50
Wrought iron pipe—	
¾ inches to 1¼ inches	33
2 to 2½ inches	40
3 to 6 inches	50
8 to 10 inches	75
12 inch and over	100
Pumping and regulating equipment	35
Services	40
Meters	35
Meter installations	40
House regulators	40
House regulator installations	40
Other property on customers' premises	33
Other distribution system equipment	35

Three HELTZEL Bulletins For Post-War Concrete Construction Equipment

These bulletins contain all the latest information on concrete construction equipment, **including new war-time developments.**

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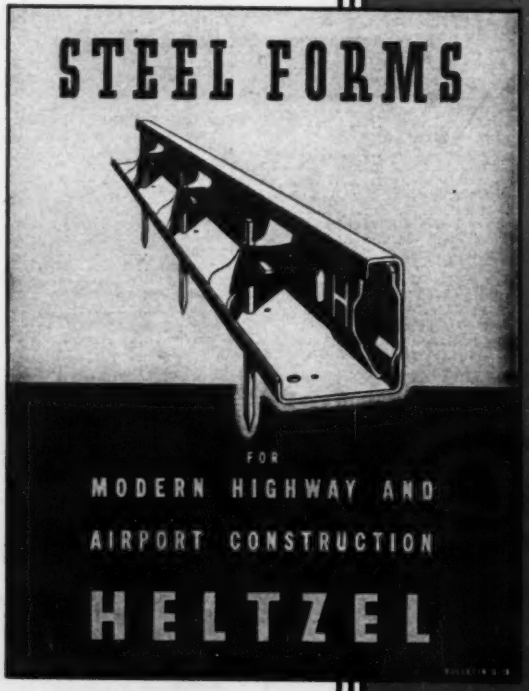
Bulletin A-20
Street Improvements



Bulletin C-34
Batching Plants

Bulletin B-19
Highway & Airport Forms

HELTZEL Steel Form & Iron Co., Warren, Ohio

Roadbuilding Costs

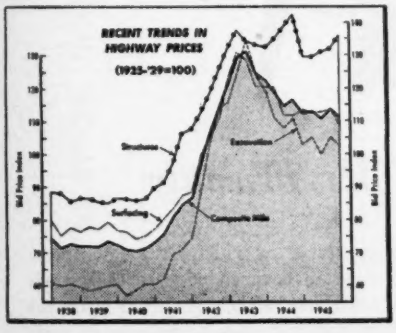
THE COST of constructing a composite standard mile of highway in 1944 declined 11½ percent from the all-time high average of 1943 according to the Index of Highway Construction Costs of the Public Roads Administration. The 1945 index average, 112.0, was also below last year, but exceeds all other annual values since 1924.

The PRA Index is based on average prices in the 1925-'29 period for a composite mile of road. It includes excavation, surfacing and structures. Quantities involved in these three items are considered as constant for the index, but in actual practice, of course, they vary from job to job.

Highway excavation bid price averaged 36c. per cubic yard in 1945 compared with 38c. in 1944. The 1945 value was 37c. in the first quarter, and 36c. in the final quarter. High years since the 1920's on excavation have been: 1943, 44c., 1944, 38c., 1942, 37c., 1945, 36c.

Surfacing costs, $2.48 per square yard, dropped 2 percent below a year ago, but were higher than any other annual average on record except 1944 at $2.54. The year opened at $2.50 but was down to $2.42 per square yard for the fourth quarter.

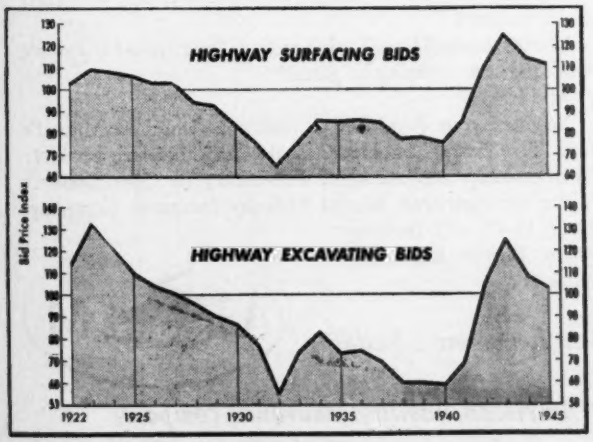
The structures index for 1945 dropped 3.8 percent below its record high of last year, but the index value, after reaching the peak of 142.7 in the third quarter of 1944, dropped to 129.5 in the opening quarter of 1945, then climbed back to 132.2 in the final quarter.

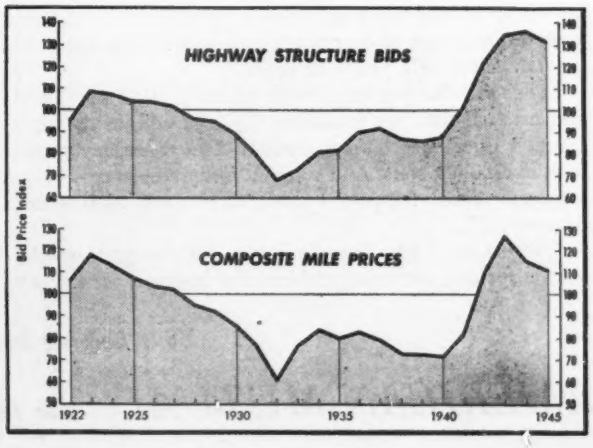


Public Roads Administration
Price Trend in Highway Construction for Composite Standard Mile

Year	Excavation [1] (17,491* cubic yards)		Surfacing [2] (3,726* square yards)		Structures				Composite mile
					Reinforcing steel (16,000* pounds)	Structural steel (4,325* pounds)	Structural concrete (68* cubic yards)	Combined	
	Bid price [3]	Sub-index	Bid price [3]	Sub-index	Bid price [3]	Bid price [3]	Bid price [3]	Sub-index	Index
Base period, 1925 to 1929	$0.35†	100.0	$2.22†	100.0	$0.052†	$0.067†	$22.15†	100.0	100.0
1922	.40	114.5	2.28	102.7	.050	.074	20.18	95.1	105.8
1923	.47	133.3	2.43	109.5	.057	.078	23.37	108.6	117.9
1924	.43	122.2	2.40	108.3	.057	.077	22.91	107.2	113.1
1925	.39	110.0	2.36	106.4	.056	.067	22.53	103.9	107.5
1926	.36	103.7	2.29	103.1	.053	.074	22.76	103.7	103.4
1927	.35	100.3	2.29	103.3	.051	.071	22.65	101.5	101.9
1928	.34	96.0	2.10	94.5	.049	.067	21.22	96.1	95.3
1929	.32	90.0	2.05	92.7	.048	.059	21.58	95.0	92.1
1930	.30	86.3	1.86	84.1	.045	.061	20.08	89.4	85.7
1931	.27	77.6	1.68	75.6	.040	.054	18.02	79.9	76.8
1932	.18	55.0	1.44	64.8	.034	.046	15.33	68.0	61.0
1933	.26	74.0	1.67	75.1	.038	.046	16.15	72.2	76.7
1934	.29	83.3	1.90	85.8	.043	.053	17.73	80.8	84.0
1935	.26	73.3	1.90	85.6	.044	.052	17.78	81.5	80.6
1936	.26	74.8	1.91	86.0	.046	.060	20.25	90.0	82.9
1937	.24	69.0	1.89	85.1	.048	.066	19.76	91.5	79.4
1938	.21	59.8	1.72	77.5	.045	.063	19.06	87.2	72.8
1939	.21	59.8	1.73	77.8	.044	.059	19.13	85.9	72.6
1940	.21	59.2	1.68	75.6	.045	.063	19.17	87.6	71.6
1941	.24	69.2	1.89	85.2	.054	.076	21.44	100.8	81.8
1942	.37	105.5	2.44	109.7	.065	.090	26.16	122.3	109.9
1943	.44	125.6	2.78	125.7	.067	.095	30.19	134.4	126.9
1944									
1st Quarter	.39	111.1	2.67	120.4	.066	.094	30.35	134.4	119.1
2d Quarter	.38	108.3	2.48	111.8	.064	.093	32.62	138.9	114.7
3d Quarter	.39	111.0	2.48	111.8	.064	.091	34.24	142.7	116.3
4th Quarter	.36	102.9	2.51	113.1	.062	.078	30.53	130.0	112.1
Average	**.38**	**108.3**	**2.54**	**114.3**	**.064**	**.089**	**31.94**	**136.5**	**115.5**
1945									
1st Quarter	.37	105.1	2.50	112.6	.062	.077	30.47	129.5	112.7
2d Quarter	.35	100.0	2.50	112.6	.061	.075	31.50	131.0	110.9
3d Quarter	.37	105.2	2.51	113.2	.062	.076	31.60	132.2	112.3
4th Quarter	.36	102.6	2.42	109.1	.062	.078	32.89	135.9	110.9
Average	**.36**	**103.2**	**2.48**	**111.9**	**.062**	**.077**	**31.62**	**132.2**	**112.0**

[1] Common excavation plus other excavation items expressed as equivalent common excavation.
[2] Portland-cement concrete plus other surfacing items expressed as equivalent portland-cement concrete.
[3] Indexes and totals were calculated with the bid prices carried to one more decimal place than that to which they are shown in this table.
Column showing amount of bid price times fixed quantity omitted in this table.
* Fixed quantities used for establishing composite mile for price trend.
† Fixed prices used for establishing composite mile index base.





"The eclipse is all in your mind," said Mr. Friendly

"Nonsense!" sneered Contractor Don Jordan. "Look at the sun. Every day at twelve it gets dim as a birthday candle. Don't try to tell me that it's only in my mind!"

"It is," interrupted Mr. Friendly. "Your worries are producing a temporary mental blackout. Now, my company, American Mutual, has had 57 years of experience in dealing with the problems of contractors and construction engineers ... and we can help you with yours!"

"Then see what you can do with this one," said Don. "Labor and material costs are mounting sky high and, of course, a contract price is a contract, period! As a result, my profits look like falling stars. And suppose costly accidents hold up important jobs? Suppose I don't meet completion dates? Suppose..."

"Not so fast," Mr. Friendly cut in. "We've got a special answer for that particular problem. For instance, our low net cost of insurance through dividends which have never been less than 20% means you can have an edge to meet such variables. Our claim service and medical help are available whenever you need them, and our years of experience with accident prevention on construction jobs will help you keep accidents down."

"That's funny," Don Jordan smiled, "but darned if I don't think the sun is getting brighter."

And it was.

Brighten your days! Let us rush you American Mutual's free "Five Extras" booklet. Ask also for other free booklet: "Foremanship and Accident Prevention in Construction." Write to: American Mutual Liability Insurance Company, Dept. O-47, 142 Berkeley Street, Boston 16, Massachusetts.

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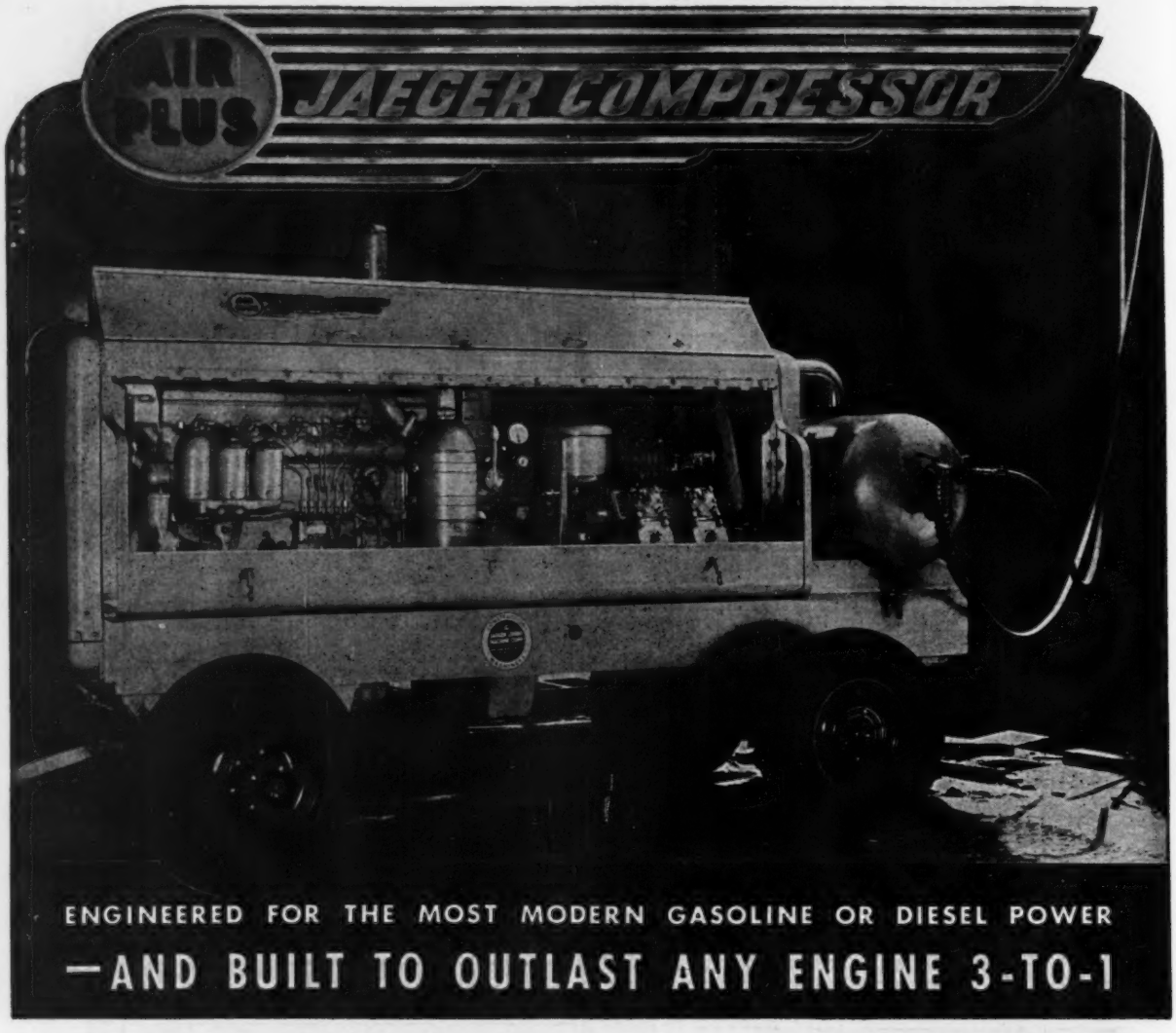
BASE RATES ON COMPENSATION INSURANCE FOR CONSTRUCTION—APRIL 1, 1946

Data Compiled by Herbert L. Jamison & Co., Insurance Advisers and Auditors, New York, N. Y.
(Base rates in effect April 1, 1946—subject to increase or decrease according to experience ratings)

Classification of Work (A)	Ala.	Ariz.	Ark.	Cal.	Colo.	Conn.	Del.	D. C.	Fla.	Ga.	Idaho	Ill.	Ind.	Iowa	Kans.	Ky.	La.	Me.	Md.	Mass.	Mich.	Minn.	Miss. (E)	Mo.	Mont.	Neb.
1. Carpentry — private residences	1.37	5.56	3.75	5.06	3.04	2.90	1.95	2.15	2.83	1.78	3.96	2.95	2.38	2.76	2.63	2.51	4.36	1.91	1.86	2.63	3.55	4.52	2.86	3.64	3.24	2.73
2. Carpentry — dwellings, 3 stories or less	1.37	5.56	4.31	5.06	3.04	3.43	1.95	2.15	2.83	1.81	3.96	2.95	2.38	2.76	2.63	2.71	4.36	1.91	1.86	2.63	3.55	4.52	2.86	3.64	3.24	2.73
3. Carpentry — interior trim	.81	5.56	2.27	5.06	1.27	1.98	1.95	1.75	1.00	.92	1.94	1.16	1.06	1.16	1.15	.93	1.70	1.29	1.25	1.67	1.83	4.52	1.99	3.64	1.58	1.37
4. Carpentry — general	1.98	5.56	8.34	5.06	3.23	5.70	1.95	3.41	2.83	3.59	6.51	4.19	3.69	2.76	3.65	3.70	4.55	4.82	3.14	7.60	3.55	4.52	11.50	3.64	5.34	3.60
5. Concrete and cement walk laying (B)	1.01	2.68	2.51	1.87	1.55	2.19	(L)	1.43	1.30	1.40	2.42	1.80	1.18	1.41	1.42	1.13	2.08	1.64	1.86	2.17	1.25	1.76	2.61	2.49	1.97	1.71
6. Concrete work — general (B)	2.03	6.33	5.27	4.50	3.59	6.15	1.70	3.85	2.58	2.14	6.43	3.21	2.34	3.26	3.41	2.45	5.73	2.86	2.61	5.48	3.75	4.17	9.71	4.91	4.84	3.60
7. Concrete work — dwellings, 3 stories or less (B)	1.06	6.33	3.34	4.50	2.84	4.09	1.70	3.47	1.87	1.08	3.16	1.90	1.51	1.64	1.90	1.14	2.66	2.89	2.84	5.10	1.61	2.58	6.83	3.47	2.55	2.09
8. Electric wiring	1.00	2.83	2.39	2.45	1.56	2.03	1.25	1.62	1.37	1.27	2.20	1.32	1.28	1.65	1.22	1.15	1.73	1.27	1.23	1.43	1.53	1.63	2.40	1.88	1.77	2.09
9. Excavation — earth (C)	1.68	5.61	4.28	3.19	4.57	4.07	1.40	2.83	1.95	1.37	6.74	2.59	1.79	2.60	2.76	2.10	2.44	2.45	2.62	4.53	2.18	3.75	5.34	3.02	5.37	2.61
10. Excavation — rock (D)	2.87	11.33	7.60	8.36	4.49	6.95	1.40	5.44	3.85	3.04	7.63	4.59	3.76	3.86	4.14	3.39	5.83	4.15	3.95	8.53	4.69	5.64	9.93	7.37	5.94	5.11
11. Glazing	2.32	5.52	5.78	5.39	3.52	5.27	.70	3.87	3.13	2.47	5.78	3.56	3.01	3.13	3.31	2.71	4.65	3.50	3.19	3.94	3.46	4.37	3.71	4.79	4.73	3.84
12. Lathing	1.10	4.07	3.02	4.60	1.69	2.59	.80	1.86	1.30	1.21	(L)	1.50	1.43	1.51	1.56	1.26	2.23	1.72	1.54	2.56	1.81	1.89	2.46	3.30	2.19	1.84
13. Masonry	1.06	4.39	3.34	2.99	2.84	4.12	1.05	1.92	1.87	1.08	3.16	2.20	1.51	1.64	1.90	1.14	2.66	2.89	2.04	5.10	1.61	2.58	6.83	3.47	2.55	2.09
14. Painting (J)	1.95	5.29	3.99	4.80	2.89	3.90	1.10	2.63	2.08	1.86	4.52	2.33	2.54	2.23	2.00	2.17	3.13	2.43	2.53	(K)11.48	2.68	3.34	3.21	4.17	3.71	2.97
15. Plastering	1.29	3.57	3.31	4.60	2.07	2.67	.80	2.33	1.67	1.13	3.27	1.98	1.78	1.78	1.91	1.48	2.42	2.08	2.11	3.10	1.73	2.52	2.46	3.26	2.64	2.22
16. Plumbing	.78	2.40	1.91	1.84	1.49	1.90	.65	1.70	.98	.78	2.33	1.26	1.23	1.41	1.11	.88	2.15	1.48	1.39	1.72	1.28	1.96	2.94	1.64	1.92	1.66
17. Roofing	3.58	9.78	9.78	9.24	6.09	9.97	1.25	5.71	3.62	3.23	11.12	6.86	4.64	7.24	6.53	4.56	7.78	6.99	6.19	10.40	8.10	9.97	8.42	7.04	9.12	8.13
18. Sheet metal erection	1.73	4.53	3.89	2.99	2.12	3.38	1.25	2.22	1.72	1.51	3.30	2.27	1.86	2.36	1.79	1.77	3.76	2.13	2.09	1.71	1.85	1.87	6.25	2.99	2.69	2.77
19. Steel erection — general	5.86	20.31	16.37	8.68	9.43	13.54	4.00	14.10	6.44	5.15	15.87	8.55	5.09	10.47	7.72	5.43	10.85	9.05	7.60	16.88	8.50	9.48	19.06	9.80	12.88	10.14
20. Steel erection — structural	9.50	20.31	17.94	16.04	15.27	13.54	4.00	17.82	9.19	7.80	22.37	8.55	7.11	13.25	11.72	9.68	12.37	11.10	9.92	17.01	18.45	10.19	32.39	19.80	18.56	14.17
21. Steel erection — interior ornamental	1.59	3.89	4.23	3.57	2.41	3.72	4.00	3.89	2.08	1.71	(L)	2.51	2.06	2.14	2.27	1.81	3.27	2.45	2.20	3.18	2.40	3.08	7.35	4.07	3.15	2.62
22. Steel erection — dwellings, 3 stories or less	3.74	8.04	11.17	16.04	5.85	9.05	4.00	6.34	5.36	4.65	10.35	6.37	5.01	5.02	5.89	5.18	7.93	6.48	5.41	16.88	7.70	7.45	14.77	11.07	8.53	6.35
23. Tile laying	.72	2.46	1.94	1.40	1.09	1.75	.40	1.92	.98	.81	1.68	1.10	.91	1.00	1.00	.80	1.46	1.14	1.15	1.60	1.65	1.54	1.39	1.68	1.36	1.20
24. Watchmen and timekeepers (I)	1.61	4.07	3.56	(G)	2.48	3.85	(G)	2.71	2.17	1.81	3.82	2.65	2.06	2.23	2.27	1.81	3.31	2.51	2.22	3.52	2.56	3.12	5.41	4.10	3.11	2.69
25. Waterproofing																										
Application by means of brush	1.95	4.94	3.99	4.46	2.89	3.90	(L)	2.63	2.08	1.86	4.52	2.33	2.54	2.23	2.00	2.17	3.13	2.43	2.53	11.48	2.68	3.34	(L)	4.17	3.71	2.97
Application by means of trowel (interior)	1.29	4.94	3.31	4.46	2.07	2.67	(L)	2.33	1.67	1.13	3.27	1.98	1.78	1.78	1.91	1.48	2.42	2.08	2.11	3.10	1.73	2.52	(L)	3.26	2.64	2.22
Application by means of trowel (exterior)	1.06	4.94	3.34	4.46	2.84	4.12	(L)	1.92	1.87	1.08	3.16	2.20	1.51	1.64	1.90	1.14	2.66	2.89	2.04	5.10	1.61	2.58	(L)	3.47	2.55	2.09
Application by means of pressure gun	2.03	4.94	5.27	4.46	3.59	6.15	(L)	3.85	2.58	2.14	6.43	3.21	2.34	3.26	3.41	2.45	5.73	2.86	2.61	5.48	3.75	4.17	(L)	4.91	4.84	3.60
26. Wrecking	9.25	28.43	23.09	21.22	14.15	20.78	11.00	15.55	12.65	9.47	(L)	13.32	9.10	12.52	10.12	10.59	20.59	14.01	14.70	17.97	31.09	14.26	23.44	19.48	18.94	15.34

Classification of Work (A)	Nev.(F)	N. H.	N. J.	N. M.	N. Y.	N. C.	N.D.(F)	Ohio(F)	Okla.	Ore.(H)	Pa.	R. I.	S. C.	S. D.	Tenn.	Tex.	Utah	Vt.	Va.	Wash.(H)	W.Va.(F)	Wis.	Wyo.(F)
1. Carpentry — private residences	Nevada Industrial Commission, Carson City, Nev.	2.01	5.80	1.95	6.31	1.91	North Dakota State Plan: Workmen's Compensation Bureau, Bismarck, N. D.	Ohio State Plan: Workmen's Compensation, The Industrial Commission of Ohio, Actuarial Section, Columbus, Ohio	5.42	6.36	1.95	5.42	3.35	2.40	2.17	2.58	3.02	2.08	1.35	4.59	West Virginia State Plan: State Compensation Commission, Charleston, W. Va.	3.73	Wyoming State Plan: Manager, Workmen's Compensation Dept., State Treasurer's Office, Cheyenne, Wyo.
2. Carpentry — dwellings, 3 stories or less		2.01	5.80	1.95	6.31	1.91			5.42	6.36	1.95	5.42	3.35	2.40	2.17	2.58	3.02	2.08	1.35	4.59		3.73	
3. Carpentry — interior trim		1.26	3.80	.95	6.31	1.35			2.70	2.94	1.95	3.28	1.66	1.09	1.19	1.86	3.02	.89	.89	1.50		3.73	
4. Carpentry — general		4.13	7.20	3.11	6.31	2.70			6.62	7.49	1.95	12.29	6.77	2.40	3.54	3.90	3.02	3.28	2.47	6.08		3.73	
5. Concrete and cement walk laying (B)		1.54	3.50	1.19	3.78	1.27			3.01	3.19	2.00	3.94	2.33	1.32	1.46	1.90	2.44	1.12	.89	2.30		2.17	
6. Concrete work — general (B)		4.29	8.60	2.75	6.05	2.82			9.58	6.69	4.00	6.68	7.35	2.82	2.38	3.90	6.52	2.44	2.07	5.15		3.31	
7. Concrete work — dwellings, 3 stories or less (B)		2.64	7.90	1.48	6.05	1.46			5.10	5.83	4.00	5.83	2.79	1.34	1.54	3.90	4.02	2.23	1.01	4.48		2.83	
8. Electric wiring		1.33	1.95	1.02	2.69	1.24			2.80	3.29	1.35	2.80	2.15	1.14	1.40	1.48	2.02	.97	1.01	2.53		1.96	
9. Excavation — earth (C)		3.18	7.90	4.14	5.64	1.82			4.59	7.46	2.50	9.73	4.10	2.11	1.82	3.00	6.52	2.69	1.45	5.39		3.86	
10. Excavation — rock (D)		4.28	11.90	3.32	11.31	6.28			9.36	(L)	2.50	12.76	6.64	3.30	4.22	5.99	7.35	3.03	3.19	10.49		7.51	
11. Glazing		3.44	7.20	2.67	10.50	3.33			7.46	6.73	1.25	9.71	5.33	2.68	3.28	4.77	2.02	2.45	2.29	5.17		7.49	
12. Lathing		1.66	5.70	1.27	2.95	1.59			3.59	5.72	1.10	4.52	2.46	1.35	1.59	2.50	3.06	1.18	1.12	4.04		3.23	
13. Masonry		2.64	8.30	1.48	7.80	1.46			5.10	5.83	1.95	5.83	2.67	1.34	1.54	3.90	4.32	2.23	1.19	4.48		2.83	
14. Painting (J)		2.29	8.60	2.01	7.39	2.17			4.30	6.67	2.60	7.00	3.71	2.25	2.08	3.17	2.77	1.89	1.28	5.13		2.74	
15. Plastering		2.03	5.70	1.53	6.12	1.74			4.12	5.72	1.10	5.27	2.70	1.67	1.66	2.36	5.52	1.44	1.00	4.04		2.39	
16. Plumbing		1.56	3.40	1.40	3.25	1.06			2.46	2.91	1.20	3.09	1.82	1.37	1.23	1.65	1.52	1.29	.82	2.24		1.59	
17. Roofing		7.23	12.70	6.62	18.03	3.85			19.26	15.59	2.50	17.48	9.18	5.14	4.97	7.19	9.10	4.68	3.80	(L)		10.73	
18. Sheet metal erection		2.03	3.60	1.58	5.60	1.93			3.98	6.42	2.50	5.06	2.84	1.67	2.17	2.41	4.02	1.47	1.77	4.59		3.47	
19. Steel erection — general		9.13	15.00	6.63	16.35	11.06			18.27	(L)	7.50	26.89	13.40	6.50	7.34	8.08	15.02	6.40	5.08	12.98		9.77	
20. Steel erection — structural		12.76	22.10	10.52	28.17	13.72			26.50	25.39	7.50	33.95	19.82	9.19	10.73	11.87	15.02	8.94	6.93	19.52		13.57	
21. Steel erection — interior ornamental		2.36	(L)	1.83	4.59	2.27			5.26	5.94	7.50	6.56	3.48	1.94	2.31	3.45	3.02	1.69	1.59	4.57		3.92	
22. Steel erection — dwellings, 3 stories or less		6.16	11.90	4.75	12.46	5.41			12.45	12.19	7.50	18.21	9.98	4.22	5.63	8.08	9.96	4.51	3.89	9.53		6.75	
23. Tile laying		1.11	2.30	.84	4.75	.98			2.34	2.10	.75	2.79	1.51	.95	1.05	1.50	3.82	.79	.75	1.62		1.54	
24. Watchmen and timekeepers (I)		2.39	(L)	1.85	8.38	2.27			5.24	5.45	(G)	6.46	3.01	2.06	2.34	(G)	4.00	1.73	1.66	4.69		4.45	
25. Waterproofing																							
App ication by means of brush		2.29	6.90	2.01	7.39	2.17			4.30	(L)	(L)	7.00	3.71	2.25	2.08	3.17	2.77	1.89	1.28	(L)		2.74	
Application by means of trowel (interior)		2.03	6.90	1.53	6.12	1.74			4.12	(L)	(L)	5.27	2.70	1.67	1.66	2.36	5.52	1.44	1.00	(L)		2.39	
Application by means of trowel (exterior)		2.64	6.90	1.48	7.80	1.46			5.10	(L)	(L)	5.83	2.67	1.34	1.54	3.90	4.32	2.23	1.19	(L)		2.83	
Application by means of pressure gun		4.29	6.90	2.75	6.05	2.82			9.58	(L)	(L)	6.68	7.35	2.82	2.38	3.90	6.52	2.44	2.07	(L)		3.31	
26. Wrecking		13.85	32.20	10.71	(M)	13.36			24.46	32.43	20.00	33.20	20.61	10.92	13.05	17.75	37.56	9.81	9.59	24.93		27.79	

Notes: (A) Special rates for government projects. (B) Includes construction of forms. (C) Includes blasting, but not caisson or coffer dam work. (D) Special rates for occupational disease coverage. (E) Employer's liability rates — no compensation law. (F) Compensation must be insured in Monopolistic State Fund. (G) Assign operation to principal classification. (H) Operation specified as hazardous by law must be insured in State Fund. (I) Not available if general contractor is conducting operations at job. (J) Painting of bridges and steel structures rated as steel erection. (K) Painting indoors — rate of 1.12 in Mass. (L) Rate available only on application to company. (M) Wrecking of structures based on cubic content.



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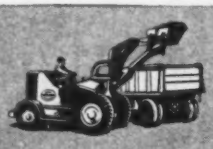
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Construction Equipment Rental Rates

EQUIPMENT RENTAL RATES were established May 11, 1942 by the Maximum Price Regulation No. 134 with rates fixed at about those of the Associated Equipment Distributors "Green Book."

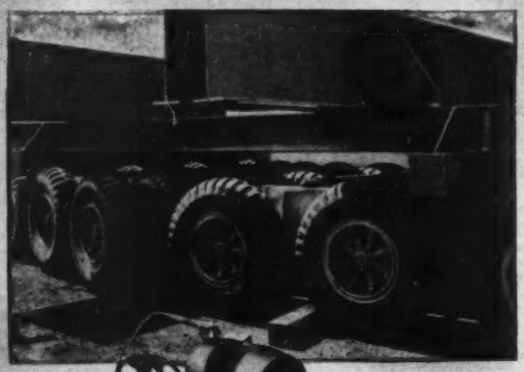
As revised under dates of Oct. 16 and Nov. 23, 1942, and Feb. 1, 1945, the regulation list dollar and cents maximum rental rates for month, week or day for machines common to construction. Rates given are for actual use of not more than 8 hours in a calendar day with a maximum of 50 percent added for use up to 16 hours and 100 percent up to 24 hours. Prices are for machines "bare" without fuel, lubricants or operators, or for repairs or maintenance charges.

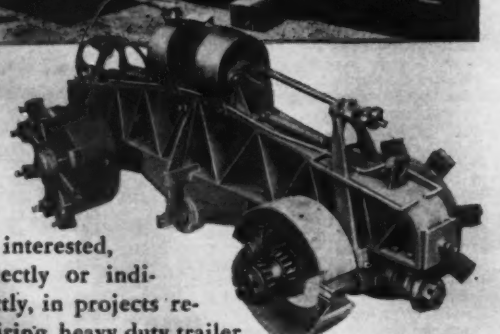
Sample equipment rental rates from Maximum Price—Regulation No. 134 through Amendment No. 17

	Per Month	Per Week	Per Day
Air Compressors			
Portable, gasoline 105–106 cu. ft. 100 psi	$185	$62	$15.50
Portable, gasoline 160–210 cu. ft. 100 psi	260	87	21.75
Portable, diesel 160–210 cu. ft. 100 psi	298	99	25.00
Portable, diesel 425–500 cu. ft. 100 psi	608	203	51.00
Stationary, electric 160–215 cu. ft. 100 psi	155	52	13.00
Stationary, electric 470–570 cu. ft. 100 psi	280	93	23.00
Stationary, electric 900–1200 cu. ft., low pressure	365	121	30.00
Air Tools			
Clay spades, small	20	10	2.50
Drifters	65	22	6.00
Hoists to 1500-lb. single-drum	50	18	4.50
Hoists, 1500–2500 lb. double-drum	80	27	6.50
Hose, over ⅝ in. 50-ft. length	6	3	1.50
Jack-hammer 51–68 lb.	35	12	3.00
Paving breakers 70–90 lb.	35	15	3.50
Rivet hammers	25	10	3.50
Vibrators, concrete, rigid type	50	16½	4.25
Wagon drill (with air hoist)	165	50	10.00
Boilers			
Vertical 18–24 hp	75	25	6.25
Vertical 32–55 hp	100	33	8.50
Horizontal 55–70 hp	110	37	9.00
Horizontal 90–125 hp	175	58	15.00
Buckets			
Clamshell ¾ cu. yd	67	22	5.50
Clamshell ¾ cu. yd	90	30	7.50
Clamshell 1½ cu. yd	140	46	11.50
Concrete bottom-dump 1 cu. yd	35	11½	3.00
Concrete bottom-dump 2 cu. yd	50	16¾	4.25
Dragline 1 cu. yd	85	28	7.00
Dragline 1½ cu. yd	105	35	8.75
Dragline 2 cu. yd	125	42	10.50
Orangepeel 1¼ cu. yd	175	58	14.50
Bulldozers—see tractors			
Concrete carts 6 cu. ft. rubber tired	12	4	.....
Concrete carts 9–11 cu. ft. rubber tired	15	5	.....
Cranes (capacity at ft. radius)			
Crawler gasoline 4½–7½ ton 12	450	150	38.00
Crawler gasoline 14½–19½ ton 12	675	225	56.00
Crawler gasoline 18½–26 ton 20	1,400	467	117.00
Crawler diesel 14½–19½ ton 12	800	267	62.00
Crawler diesel 18½–26 ton 20	1,700	567	142.00
Crawler diesel 14½–20 ton 45	2,725	908	227.00
Crawler steam 18½–24½ ton 12	725	242	60.00
Locomotive gas 27–32 ton 12	1,300	430	108.00
Locomotive steam 27–32 ton 12	1,180	393	98.00
Truck-mounted gas 7–9 ton 10 (per hour $5.50)	700	230	58.25
Truck-mounted gas 12–14½ ton 10 (per hr. $6.00)	925	300	77.00
Crushers (without accessories or power)			
Openings 9x16	85	28	7.00
Openings 10x30	190	63	16.00
Openings 12x36	265	88	22.00
Derricks			
Stiff-leg wood 3½–4½ ton	100	33	8.50
Stiff-leg steel 4–6 ton 50–80 ft. boom	215	72	18.00
Stiff-leg steel 13–17 ton–100 ft. boom	390	130	33.00
Stiff-leg steel 32–42 ton 70–100 ft. boom	555	185	46.00
Guy 13–17 ton 70–110 ft. boom	245	82	20.00
Guy 35–45 ton 100–120 ft. boom	450	150	37.00
Engines			
Gasoline with clutch 22–30 hp	50	17	4.50
Gasoline with clutch 55–70 hp	90	30	7.50
Diesel with clutch 22–30 hp	75	25	6.50
Diesel with clutch 55–70 hp	135	45	11.00
Diesel with clutch 90–115 hp	245	82	20.00
Finegraders 11–16 ft. width (self-powered)	650	216½	70.75
Finishing machines			
Concrete-floor (powered)	60	20	5.00
Road finishers 12–18 ft. roadway	447	149	37.25
Road finishers 24–30 ft. roadway	495	165	41.25
Bituminous machines	750	250	63.00
Graders			
Single drive—8,600 to 14,000 lb. gasoline	275	92	23.00
Tandem drive 19,000–21,000 lb. gasoline	470	156	39.00
Tandem drive 18,500–21,500 lb. diesel	525	173	42.00
Towed-power operated 9–11 ft.	190	63	15.75
Pile hammers			
Drop 1,500–2,250 lb.	20	7	2.00
McKiernan-Terry #2	60	20	5.00
McKiernan-Terry #7	140	46½	11.75
Pile Hammers (Cont'd.)			
McKiernan-Terry #10B2 or 3	$270	$90	$22.50
Vulcan #1	290	96½	24.25
Vulcan #00	405	135	33.75
Vulcan Pile Extractor #800	220	73½	18.25
Tank Car Heater 2–3 car capacity	210	75	20.00
Hoists			
Gasoline single-drum 29–42 hp	95	32	8.00
Gasoline double-drum 22–28 hp	100	33	8.50
Gasoline double-drum 55–65 hp	175	58	15.00
Electric single-drum 17–27 hp	75	25	6.50
Electric double-drum 37–47 hp	138	46	11.50
Air 1,500–2,500 lb.	65	22	5.50
Chain 1½–2½ ton	20	7	2.00
Chain 4–6½ ton	30	10	2.50
Mixers, Bituminous			
Central Plant 30–50 ton per hr. (gradation control)	1,573	524	131.00
Central Plant 70–90 ton per hr. (gradation control)	2,217	739	185.00
Traveling Plant 1¼–1¾ cu. yd. per min	1,085	362	90.00
Mixers, Concrete			
Power charger 6S to 8½S	85	28	7.00
Power charger 12S to 16S	155	52	13.00
Batch hopper 25S to 30S	210	70	17.50
Paver 27-E, 1- and 2-drum	935	311½	78.00
Paver 34-E, single drum	1,335	445	111.25
Pumpcrete (concrete pump) gasoline			
Model 160 single cylinder (no remixer)	466	155½	38.75
Model 200 double cylinder (with remixer)	1,322	440½	110.25
Pumps			
Centrifugal, gasoline, 2 in. 7 to 10 M	40	13	3.00
Centrifugal, gasoline, 4 in. 30 to 40 M	80	27	7.00
Centrifugal, gasoline, 8 in. 125 M	195	65	16.00
Diaphragm force or open 3 in. double	50	17	5.00
Diaphragm force or open 4 in. double	60	20	5.00
Rollers			
Two-wheel tandem 5–9½ ton gasoline	250	83	21.00
Two-wheel tandem 12½–17½ ton gasoline	325	108	27.00
Three-wheel 5½–6½ ton gasoline	200	67	16.00
Three-wheel 7½–9 ton gasoline	270	90	22.00
Three-wheel 11–13 ton gasoline	425	142	35.00
Sheepsfoot, double drum	90	30	7.50
Sheepsfoot, triple drum	175	58	15.00
Shovels and back-hoes (dipper included)			
Crawler, gasoline ¾ cu. yd	440	147	37.00
Crawler, gasoline ¾ cu. yd	605	201	50.00
Crawler, gasoline 1¼ cu. yd	880	293	73.00
Crawler, diesel ¾ cu. yd	715	238	60.00
Crawler, diesel 1¼ cu. yd	1,045	348	87.00
Crawler, diesel 2 cu. yd	1,980	660	165.00
Surveying instruments			
Levels	20	8	5.00
Transits	25	9	5.00
Tractor, crawler, and attachments			
33–41 hp. gasoline	265	88	22.00
66–85 hp. gasoline	425	142	35.00
46–52 hp. diesel	410	137	34.00
72–89 hp. diesel	645	215	54.00
89–135 hp. diesel	775	258	65.00
Winch, any size, double drum	75	25	6.50
Bulldozer 66–89 hp. tractor	120	40	10.00
Angledozer 66–89 hp. tractor	148	49	12.00
Tractors-wheeled			
4 wheel, rubber tired diesel 93–103 hp	530	175	45.00
4 wheel, rubber tired diesel 140–160 hp	855	285	70.00
2 wheel rubber tired diesel 145–160 hp	780	260	65.00
2 wheel rubber tired diesel 195–210 hp	1,385	461	115.00
Scrapers and Wagons (heaped measure)			
Scraper 7–10 cu. yd	250	85	21.00
Scraper 17–22 cu. yd	575	190	48.00
Scraper 29–37 cu. yd	1,025	340	85.00
Crawler wagons, bottom dump 9½–12½ cu. yd.	240	80	20.00
Crawler wagons, bottom dump 14½–20½ cu. yd.	370	123	31.00
Vibrators, gasoline, flexible shaft			
Up to 1½ hp. 28 ft. shafting	35	11½	3.00
3½–4½ hp., 46 ft. shafting	60	20	5.00
Welding Machines, wheels or skids			
Gasoline-engine driven up to 250 amp	74	25	6.00
Gasoline-engine driven 350 to 500 amp	114	38	9.50
60 cycle motor driven up to 250 amp	35	12	3.00
60 cycle motor driven 350 to 500 amp	56	19	4.50

LOGICALLY... the world's greatest trailer

was a ROGERS...





If interested, directly or indirectly, in projects requiring heavy duty trailer equipment, write for the Rogers Catalog illustrating and describing units exactly suited to all requirements.

The above trailer (*which actually had a capacity of 600 tons on improved roads with conventional heavy duty tires), was built for Eichleay Engineering Corporation, contractors for the military authorities and sold by Atlas Equipment Company, both of Pittsburgh, Penna.

THE necessity of moving a *300 ton burden, required in connection with a highly secret military test, presented unprecedented problems.

A railroad was out of the question. No vehicle of adequate capacity had ever been built. Failure was unthinkable and speed was imperative.

The search for specialized experience, engineering competency and plant facilities adequate to build a vehicle capable of handling this greatest of all moving projects led inevitably to the pioneer builders of heavy duty trailers.

Drawing upon a long career as manufacturers of commercial trailers and exceptional experience in building thousands of military tank trailers, this organization delivered in 30 days, a trailer 39 feet long and 17 feet wide.

Its sixty-four 14.00" x 24" military tires were mounted in banks of eight on axle units that permitted full oscillation to conform to uneven desert terrain and distribute the terrific load equally over all tires.

Significant was the fact that these axle units were duplicates of those that have long been used on ROGERS TRAILERS of larger capacity.

Yes, it is logical that the *world's largest trailer* should have been a ROGERS.

ROGERS BROTHERS CORPORATION
ALBION, PENNA.

EXPERIENCE builds 'em — ROGERS HEAVY DUTY Gooseneck Trailer — *PERFORMANCE sells 'em*

Index of Construction Machinery Prices

During the last quarter of 1945 average prices of construction machinery increased approximately 2.0 percent, according to the Bureau of Labor Statistics, U. S. Department of Labor. The advance was the first significant change made by the industry since November 1941 and caused the Bureau's index of prices of construction machinery to rise to 112.8 percent of the August 1939 average by the end of the year. Prices for most of the major types of construction equipment rose during the quarter, following O.P.A.'s announcement that manufacturers were authorized to increase prices as much as 5.0 percent for the period October 1, 1945, through January 1946 (later extended to May 15). Average prices for the year 1945 were 11.1 percent above prewar levels.

The composite index of prices of construction machinery rose slightly less than 2.0 percent in October and November, when those manufacturers who took advantage of the price relief afforded by O.P.A. increased their prices 5.0 percent. A large number of producers did not advance prices within the month, which explains the smaller rise in the Bureau's index. Also, many companies introduced new models during this period, and in most instances it was impossible to distinguish between any price increase which may have accompanied the introduction of the new machines from the change due to the change in specifications.

Prices of the different types of machines rose in varying degrees during the last quarter of 1945. The largest price increases, approximately 2.5 percent, were in prices of track-laying tractors, and in prices of scrapers, maintainers and graders, 2.0 percent. Average prices of rippers, rollers, ditchers and contractors' wagons (specialized machinery); mixers, pavers, spreaders and related equipment; power cranes and shovels; and portable jaw and roll crushers (material processing equipment) rose approximately 1.5 percent. Manufacturers of portable air compressors and of drilling and boring machines maintained their prices unchanged. Current quotations for drilling and boring equipment were the same as those in August, 1939, while portable air compressors are selling about 2.0 percent below prewar levels.

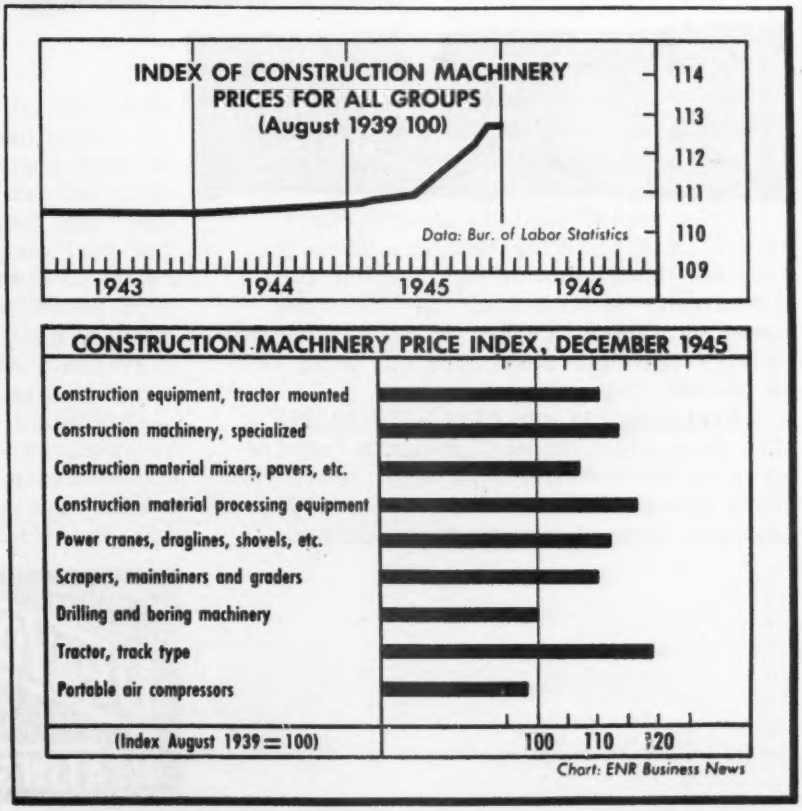
This index is computed quarterly by the Bureau of Labor Statistics. U. S. Department of Labor.

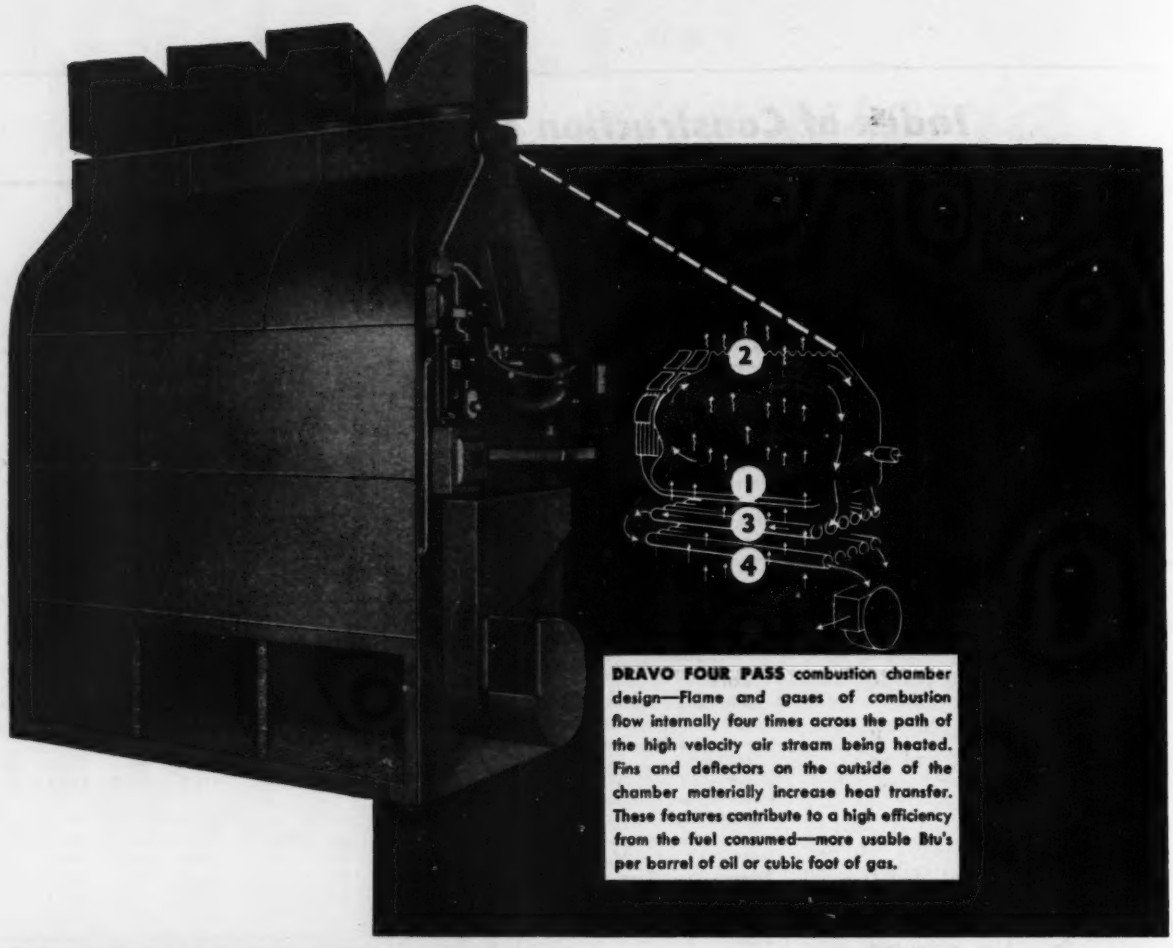
TABLE 1.—INDEX OF PRICES OF CONSTRUCTION MACHINERY
August 1939—December 1945—Bureau of Labor Statistics
(August 1939 = 100)

	1939	1940	1941	1942	1943	1944	1945
January	.....	100.6	103.2	110.5	110.5	110.5	110.7
February	.....	100.6	103.6	110.5	110.5	110.5	110.8
March	.....	100.6	104.2	110.5	110.5	110.5	110.8
April	.....	100.8	105.0	110.5	110.5	110.5	110.8
May	.....	100.9	105.5	110.5	110.5	110.5	110.9
June	.....	100.9	106.2	110.5	110.5	110.5	110.9
July	.....	101.3	106.5	110.5	110.5	110.6	110.9
August	100.0	101.2	108.3	110.5	110.5	110.6	110.9
September	100.0	101.4	109.3	110.5	110.5	110.6	110.9
October	100.1	102.3	110.0	110.5	110.5	110.6	112.3
November	100.4	102.3	110.4	110.5	110.5	110.6	112.8
December	100.5	102.3	110.4	110.5	110.5	110.7	112.8
Yearly Average	.....	101.3	107.0	110.5	110.5	110.6	111.1

TABLE 2.—INDEX OF PRICES OF CONSTRUCTION MACHINERY—BY GROUPS

	Aug. 1939	Dec. 1940	Oct. 1941	Dec. 1942	Dec. 1943	Dec. 1944	Dec. 1945
Constr. Equip., Tractor Mounted	100.0	100.3	108.8	108.8	108.8	109.7	110.5
Constr. Machinery, Specialized	100.0	101.1	110.8	111.5	111.8	111.8	113.5
Constr. Matl. Mixers, Pavers, Spreaders and Related Equip.	100.0	100.5	106.3	106.4	106.3	106.8	107.4
Construction Matl. Processing Equip	100.0	100.6	110.9	112.7	112.7	112.7	116.6
Power Cranes, Draglines, Shovels, and Related Equip.	100.0	101.4	110.5	110.9	110.9	110.9	112.1
Scrapers, Maintainers, and Graders	100.0	100.4	107.2	107.2	107.2	107.5	109.7
Drilling and Boring Machinery	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Tractors, Track Type	100.0	106.0	113.4	114.4	114.4	114.4	118.6
Portable Air Compressors	100.0	100.7	100.0	98.4	97.9	97.9	97.9
Constr. Machinery—All Types	100.0	102.3	110.0	110.5	110.5	110.7	112.8





DRAVO FOUR PASS combustion chamber design—Flame and gases of combustion flow internally four times across the path of the high velocity air stream being heated. Fins and deflectors on the outside of the chamber materially increase heat transfer. These features contribute to a high efficiency from the fuel consumed—more usable Btu's per barrel of oil or cubic foot of gas.

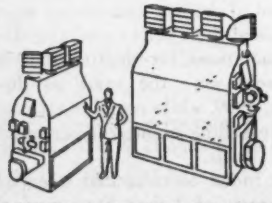
Economical Heat Exchanger Uses Direct Fuel-to-Air Principle For Large Scale Space Heating

This heater employs an efficient direct heat transfer method – through only one thickness of metal – the cool air crosses the path of the flame and gases four times before it is discharged by high velocity fans into the area to be heated.

Efficiencies run high – 80 to 85% – this fact together with minimum requirements of maintenance and care, makes the Dravo designed direct fired warm air heater a logical choice where large, unobstructed areas are to be heated.

Dravo heaters are shipped from the factory complete, with refractory material installed. When gas or oil is the fuel they need only be connected to the fuel and power lines and they are ready to operate. They can be moved from place to place to meet supplementary heat requirements. They can be operated individually if a portion of the plant is shut down. Maintenance is negligible. No specialized attendance is required. For the whole story ask for Bulletin 509-A. Address Dravo Corporation, Heater Department, 300 Penn Avenue, Pittsburgh 22, Pa.

DRAVO HEATING



300,000 TO 1,650,000 B. T. U. CAPACITY. MULTIPLE UNITS COMBINE FOR ANY OUTPUT

Cost of Financing

COST OF construction money in 1945, as measured by yields of high-grade bonds, averaged the lowest ever reported for U. S. treasury, municipal, public utility, and railroad bonds. Industrial bond yields were a fraction of a percent higher than in 1941. Treasury bond yields were 13.5 percent below a year ago; municipal bond yields were 10 percent below; and railroad bond yields down 6.6 percent.

The 1945 annual average yields for the various types of high-grade bonds in percent were: U. S. treasury, 1.66; municipal, 1.67; industrial, 2.51; public utility, 2.60; and railroad, 2.81.

In February, 1946 bond yields for all five of the above types of bonds have dropped still further from their respective December values. The February yields for municipal, industrial, public utility and railroad were: 1.49, 2.43, 2.49 and 2.71 percent, in that order.

The series for U. S. Treasury bonds, partially tax exempt is being discontinued. It will be replaced in future reports in these pages by a series for Long Term Government Bonds (Taxable) as reported monthly by Standard Statistics and Poors. The record to date on this new series is

Long Term Government Bonds (Taxable)

1942	227	1945 July	234
1943	229	Aug.	236
1944	238	Sept.	237
1945	234	Oct.	236
		Nov.	235
1945 Jan.	237	Dec.	233
Feb.	232		
Mar.	234	1946 Jan.	220
Apr.	233	Feb.	212
May	234	Mar.	209
June	232		

— Standard Statistics & Poors

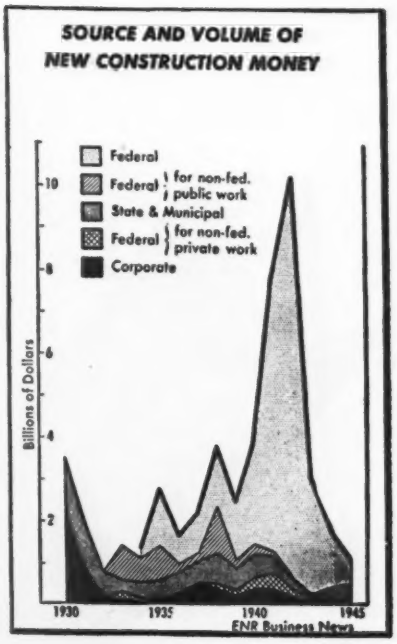
Commercial loan rates, or averages, of rates charged by banks in principal cities, averaged 2.47 percent for the nineteen reporting cities for the first 3 quarters of 1945, 4.5 percent below the 1944 value. The New York City average rate, 1.99 percent, compares with 2.11 percent last year. Seven northern and eastern cities' average rate for the first three quarters of 1945, 2.60 percent, was under the 2.68 percent for the full year 1944; and eleven southern and western cities reported a three quarters 1945 average of 2.84 percent compared with 3.02 percent for all of 1944 according to Federal Reserve Bank statistics.

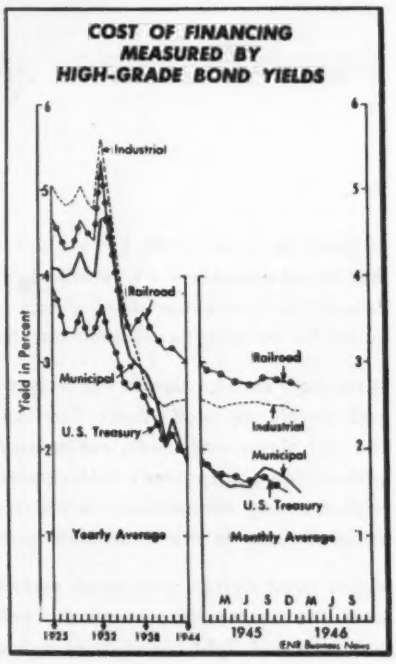
The 1945 fourth-quarter average for the nineteen reporting cities is not available as this page goes to press. The fourth-quarter average for New York City is 1.71 compared with 2.08 average for the first three quarters.

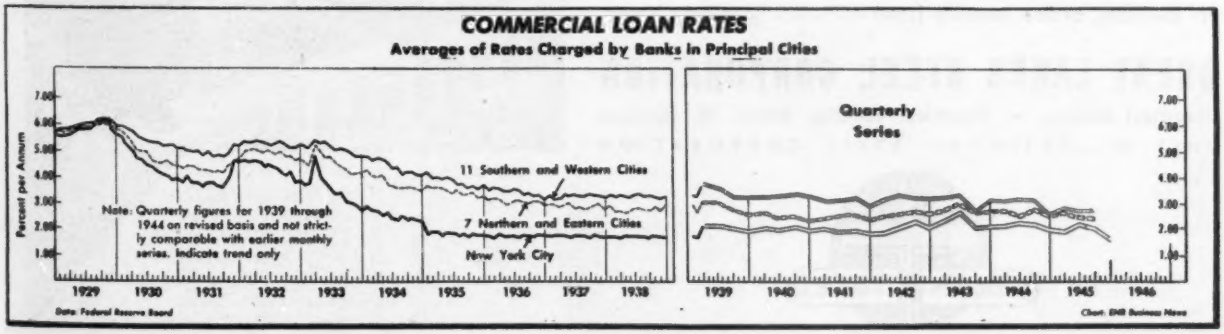
Bond Yields—Percent

	U. S. Treas. (1)	Municipal (2)	Industrial (3)	Pub. Util. (4)	Railroad (5)
1933	3.31	4.71	4.98	4.69	4.55
1934	3.12	4.03	4.28	4.19	4.01
1935	2.79	3.41	3.73	3.59	3.58
1936	2.69	3.07	3.34	3.38	3.31
1937	2.74	3.10	3.16	3.22	3.45
1938	2.61	2.91	2.82	2.99	3.60
1939	2.41	2.76	2.64	2.83	3.39
1940	2.26	2.50	2.57	2.75	3.26
1941	2.05	2.10	2.50	2.69	3.16
1942	2.09	2.36	2.54	2.71	3.17
1943	1.98	2.06	2.55	2.63	3.10
1944	1.92	1.86	2.58	2.64	3.01
1945	1.66	1.67	2.51	2.60	2.81
1945 Jan.	1.81	1.81	2.54	2.61	2.90
Feb.	1.75	1.71	2.51	2.60	2.89
Mar.	1.70	1.61	2.49	2.56	2.85
Apr.	1.68	1.57	2.51	2.56	2.81
May	1.62	1.58	2.52	2.59	2.78
June	1.63	1.58	2.53	2.60	2.78
July	1.63	1.57	2.53	2.59	2.75
Aug.	1.68	1.70	2.54	2.62	2.77
Sept.	1.68	1.79	2.52	2.62	2.81
Oct.	1.62	1.76	2.51	2.62	2.80
Nov.	1.56	1.70	2.50	2.63	2.79
Dec.	1.51	1.64	2.50	2.61	2.78
1946 Jan.	Disc.	1.57	2.44	2.55	2.77
Feb.		1.49	2.43	2.49	2.71

(1) Aver. yield of long-term U. S. Treasury bonds, partially tax exempt, not due or callable for fifteen years. Federal Reserve Bulletin.
(2) Standard Statistics & Poors — aver. 15 high-grade long-term municipals.
(3) Standard Statistics & Poors — aver. A1 plus industrials.
(4) Standard Statistics & Poors — aver. A1 plus public utilities.
(5) Standard Statistics & Poors — aver. A1 plus railroads.







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STRAN STEEL

UNIFORM IN STRENGTH AND QUALITY

In Stran-Steel, architects have a precision framing material that is not dependent on variables of growth or seasoning. Its uniformity and strength eliminate sag, warp, rot . . . safeguard the building investment and the builder's reputation.

Stran-Steel construction is not only permanent . . . it's fast and simple as well. Basic framing members are joists, channel plates and studs, cut-to-length for rapid assembly with ordinary carpenter's tools. Sheet-metal screws accomplish framing connections, while collateral materials are *nailed* directly to the Stran-Steel patented nailing groove.

Match good design with good materials. Build with Stran-Steel, the modern framework for better homes, apartment buildings and light commercial or industrial structures. For further details, see Sweet's File, Architectural, Sweet's File for Builders, or the January issue of Building Supply News.

GREAT LAKES STEEL CORPORATION

Stran-Steel Division • Penobscot Building, Detroit 26, Michigan
UNIT OF NATIONAL STEEL CORPORATION

YOU NAIL TO STRAN STEEL

Index of Small House Costs—Revised

Originally the device for measuring price variations of a moderate-priced single-family dwelling was based by the Federal Home Loan Bank Administration, Division of Operating Statistics, upon a bill of specifications that itemized in detail the quantity and quality of building materials and the number of work hours required of the various crafts to construct a six-room frame house.

The revised index now reflects price changes in a limited bill of the more important items, which closely approximates the trend in total cost of materials. This change in concept is not as drastic as it appears. Even the original 88 items were not all inclusive. Small items which contributed fractionally to total cost were not listed, but their absence was accounted for by a slightly heavier weighting of similar materials. To maintain continuity of the index selected material prices and wage rates are weighted to reflect trends in cost of building the original house.

Although this hypothetical house is standard in the index, it is not typical in the sense of being a strict average of all the houses under construction at the time. Rather, it is a frame dwelling characteristic of the modest residential districts of many American cities. The dwelling specifies high quality materials but no extravagances and would sell in 1935 or 1936 in the vicinity of $5,500 excluding land and items of equipment which are not considered part of a general contract estimate.

The house is a detached home of 24,000 cu. ft. volume, of good design, containing a living room, lavatory, dining room and kitchen on first floor, and three bedrooms and bath on second floor. An open attic may be used for storage or may be finished into one or two usable rooms. The cellar or basement is without partitions and contains heating plant and laundry facilities. Exterior treatment is assumed to be a combination of wideboard siding, with brick and stucco. A one-car attached garage is included. The plot is assumed to be approximately level with no unusual soil conditions. Materials, finish and workmanship specified are standard and typical of the practices of reputable small-house builders. Structural design is sufficient to meet all reasonable requirements of a municipal building code. Unusual materials or practices were avoided.

For a full detailed report on this index see the Federal Home Loan Review, March, 1946.

Indexes of Building Costs for Standard 6-Room Frame House (Revised) Fed. Home Loan Bank Admin.

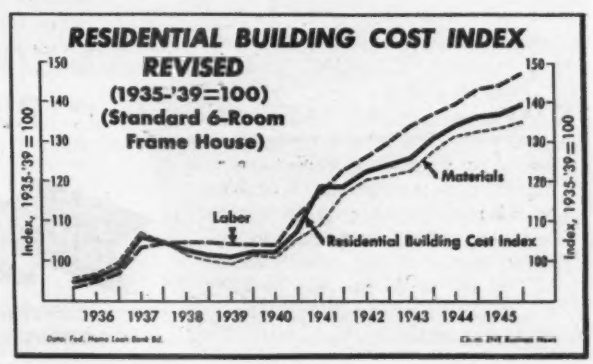
(1935-1939=100)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Combined Index												
1935											95.1	95.0
1936	95.1	95.1	95.2	95.5	95.9	96.1	96.5	96.8	97.0	97.3	97.8	98.7
1937	99.9	101.1	102.9	104.3	105.2	105.8	106.2	106.3	106.2	105.9	105.5	104.8
1938	104.2	103.7	103.3	103.0	102.7	102.6	102.5	102.1	102.0	101.7	101.7	101.6
1939	101.5	101.5	101.6	101.4	101.2	101.1	101.0	100.9	101.3	101.8	102.3	102.3
1940	102.2	102.3	102.2	102.1	102.1	102.1	102.1	102.3	102.9	104.7	106.1	107.6
1941	108.4	109.2	109.7	110.2	110.7	111.8	112.8	114.3	115.7	117.6	118.2	118.8
1942	119.5	120.4	121.3	121.6	122.0	122.6	123.0	123.4	123.3	123.5	123.6	124.3
1943	124.4	124.9	125.1	125.5	126.0	126.3	126.7	127.3	127.8	129.1	130.1	131.0
1944	131.7	132.1	132.6	133.2	133.7	134.1	134.3	134.7	135.0	135.3	135.9	136.0
1945	136.1	136.3	136.7	136.8	136.8	137.0	137.2	137.4	138.0	138.4	139.0	139.2
Material Index												
1935											95.9	95.8
1936	95.9	96.1	96.2	96.3	96.5	96.7	97.0	97.4	97.5	97.8	98.3	99.5
1937	101.0	102.6	104.6	106.0	106.7	107.0	107.2	107.3	107.0	106.5	105.9	105.9
1938	104.1	103.4	102.6	102.1	101.7	101.5	101.2	100.5	100.4	100.3	100.2	100.0
1939	99.9	99.9	99.9	99.8	99.6	99.5	99.4	99.3	99.9	100.5	101.3	101.4
1940	101.3	101.3	101.3	101.1	101.2	101.2	101.1	101.3	101.9	103.3	104.5	105.7
1941	106.4	107.2	107.9	108.2	108.4	109.0	110.2	112.1	113.8	115.7	116.3	117.1
1942	118.0	119.0	119.7	120.1	120.4	120.5	120.7	120.8	121.1	121.2	121.4	121.4
1943	121.3	121.5	121.7	121.9	122.4	122.6	123.1	123.8	124.5	126.1	127.2	128.1
1944	128.8	129.4	129.8	130.4	130.9	131.4	131.6	132.1	132.2	132.2	132.4	132.5
1945	132.5	132.8	133.1	133.2	133.4	133.5	133.8	133.9	134.1	134.6	135.0	135.2
Labor Index												
1935											93.5	93.4
1936	93.4	93.2	93.3	93.9	94.6	95.0	95.4	95.5	95.9	96.3	96.9	97.2
1937	97.6	98.2	99.4	101.1	102.2	103.5	104.2	104.5	104.6	104.7	104.8	104.5
1938	104.3	104.2	104.6	104.7	104.6	104.8	105.0	105.3	105.1	104.7	104.6	104.8
1939	104.7	104.8	104.9	104.5	104.3	104.2	104.2	104.1	104.3	104.5	104.2	104.2
1940	104.0	104.2	104.2	103.9	104.0	103.9	104.0	104.3	104.7	107.3	109.2	111.5
1941	112.6	113.2	113.3	114.2	115.3	117.3	117.9	118.8	119.5	121.6	121.9	122.4
1942	122.7	123.2	124.4	124.7	125.1	126.7	127.8	128.6	129.3	129.5	129.5	130.0
1943	130.5	131.8	132.0	132.8	133.4	133.7	133.9	134.1	134.3	135.3	135.7	136.9
1944	137.3	137.6	138.2	138.9	139.2	139.4	139.8	139.9	140.8	141.4	142.8	143.0
1945	143.3	143.4	143.8	143.8	143.8	143.9	144.0	144.4	145.9	146.1	147.1	147.3

Revised Index Compared with Old—By Years

(1935-1939=100)

Year	Revised index			Old index		
	Total	Material	Labor	Total	Material	Labor
1935	95.1	95.8	93.4	94.7	95.8	92.6
1936	96.4	97.1	95.0	96.2	97.1	94.4
1937	104.5	105.6	102.4	104.5	105.6	102.3
1938	102.6	101.5	104.7	103.8	101.5	105.4
1939	101.5	100.0	104.4	101.8	100.1	105.2
1940	103.2	102.1	105.4	103.3	102.2	105.4
1941	113.1	111.0	117.3	114.0	111.5	119.0
1942	122.4	120.4	126.8	123.2	120.8	127.9
1943	127.0	128.7	133.7	127.2	128.7	133.9
1944	134.1	131.2	139.9	132.8	130.4	137.7
1945	137.4	133.8	144.7	135.7	133.0	141.3



WHAT'S YOUR JOB?

The Buckeye Line of Cost-Cutting Construction Equipment Will Help You Handle It With Greater Profit!

Trenching?

Buckeye Trenchers—digging wheel or boom types—a model for every trenching requirement—dig through any material short of solid rock. They have made cost cutting records on every major trenching job.

Material Spreading?

Buckeye Material Spreaders with spirally fluted feed rolls, spread evenly in measured quantities, from a trickle to a 6" base course. Handle all materials, wet, dry or sticky.

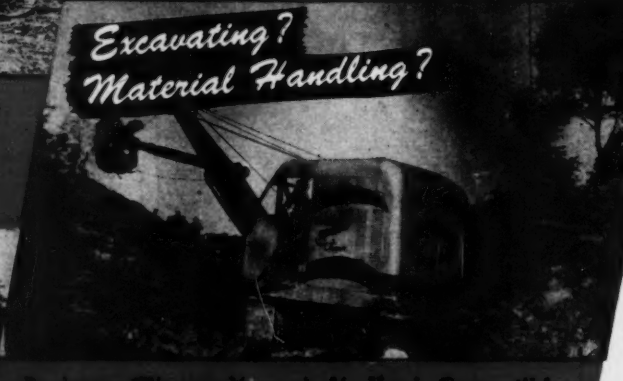
Road or Airport Construction?

Buckeye R-B Finegraders save time and money in preparing subgrade. One operation provides a smooth, properly crowned, accurate, compact subgrade ready for the paver. Finegraders work faster than paver—keep it going all the time.

Dozing?

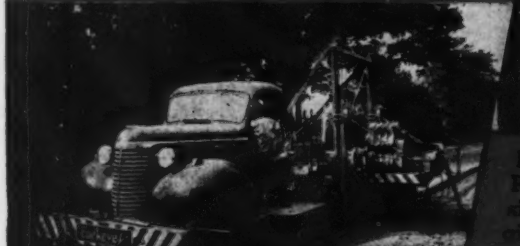
Buckeye Dozers and Trailbuilders have the "guts" for the big jobs—the balance and control for complete utilization of tractor's power. They dig in and move bigger loads with less effort.

Excavating? Material Handling?



Buckeye Clipper ¾ and 1¼ Yard Convertible Power Shovel for efficient, low cost work. Exclusive "Mevac" Metered Vacuum Power Control gives operator "real feel," quicker response.

Highway Widening?



Buckeye Highway Wideners cut smooth, clean trench of uniform width and depth true to grade, leaving subgrade ready to receive material. Cut trench from 12" to 48" wide and up to 12" deep (24" depth extra), fast and economically.

BUCKEYE TRACTION DITCHER CO.
FINDLAY, OHIO

Built by Buckeye

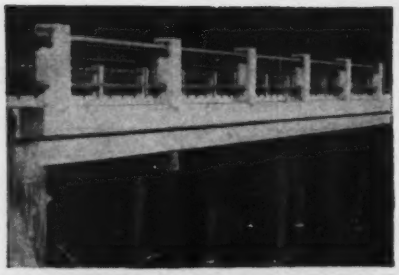
CONVERTIBLE SHOVELS—BULLDOZERS—ROAD WIDENERS
TRENCHERS—MATERIAL SPREADERS—R-B FINEGRADERS

Cost Index for Standard House in 47 Cities — 1935-1939 = 100 — Revised

Federal Home Loan Bank Board

FEDERAL HOME LOAN BANK DISTRICT AND CITY	1939				1942				1943				1944				1945			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
BOSTON: *																				
Hartford, Conn.	100.5	100.1	100.0	101.1	128.6	128.6	128.5	128.4	128.2	128.2	130.3	134.5	134.6	135.1	135.2	136.5	136.8	136.8	137.3	137.9
Portland, Maine	99.0	99.6	98.8	98.6	121.4	122.9	124.8	127.7	129.8	134.7	140.9	144.6	146.7	148.2	151.4	152.4	152.5	152.5	152.5	153.5
Boston, Mass.	102.3	100.9	101.7	103.1	123.8	123.9	125.8	125.9	128.3	126.9	128.6	130.2	130.5	132.8	133.2	133.2	133.4	133.6	133.6	134.3
Manchester, N. H.	100.2	98.8	97.0	97.9	108.0	108.4	108.7	108.7	114.1	114.3	115.4	116.2	118.1	120.0	124.2	124.4	127.1	127.1	127.1	128.0
Providence, R. I.	103.0	104.0	103.2	104.2	119.8	120.7	120.7	120.7	124.0	128.7	132.3	135.6	136.2	138.6	139.7	141.4	141.8	142.4	142.7	146.0
NEW YORK: †																				
Camden, N. J.	101.9	103.7	101.8	106.5	139.7	138.8	138.9	138.9	138.1	137.3	136.4	135.6	138.8	140.7	143.6	.....	143.2	145.2	145.2	.....
Newark, N. J.	103.5	103.4	102.6	105.6	136.5	137.0	146.3	153.9	155.5	156.1	149.7	149.7	154.5	157.1	159.3	.....	159.7	161.9	161.9	.....
Albany, N. Y.	99.5	101.6	100.4	101.9	124.6	123.2	130.9	134.2	130.2	130.4	137.6	140.6	140.6	140.4	143.8	.....	148.0	151.4	151.6	157.4
Buffalo, N. Y.	102.0	100.2	99.2	104.7	123.7	125.4	128.2	128.1	128.2	130.8	130.2	134.7	135.8	140.0	142.1	144.6	144.6	149.4	147.1	149.2
PITTSBURGH: ‡																				
Wilmington, Del.	103.7	100.7	97.5	97.0	131.0	129.7	129.7	129.7	129.2	129.2	130.0	130.8	133.4	134.2	134.9	134.9	134.9	136.2	137.0	137.9
Philadelphia, Pa.	102.0	102.6	103.8	105.6	135.0	137.6	138.5	138.3	138.8	146.2	145.7	148.3	148.5	150.0	149.7	151.1	151.4	151.9	158.3	161.1
Pittsburgh, Pa.	105.0	104.3	104.7	104.1	118.6	119.5	126.1	127.0	130.7	133.5	131.9	131.9	133.5	134.0	134.2	134.6	134.6	134.7	135.0	136.6
Charleston, W. Va.	102.0	101.6	100.9	101.6	115.9	119.1	121.3	121.3	121.1	121.3	121.3	121.6	121.6	132.3	133.4	134.2	134.2	134.1	135.4	136.1
WINSTON-SALEM: *																				
Birmingham, Ala.	100.9	98.1	97.1	99.2	115.7	115.8	115.9	115.9	115.6	118.8	124.6	124.0	126.0	126.5	128.4	128.5	128.5	127.4	127.4	127.6
Washington, D. C.	105.8	102.9	104.4	104.4	125.0	127.4	126.7	127.0	131.2	133.4	134.5	138.9	139.1	141.4	142.8	143.3	144.4	144.5	144.5	150.4
Atlanta, Ga.	96.5	95.5	94.9	97.5	120.4	122.7	122.7	125.1	130.1	130.1	134.8	137.7	140.3	142.5	143.8	146.4	145.8	145.7	148.3	151.7
Baltimore, Md.	101.4	100.8	100.0	102.1	127.1	128.7	128.7	127.8	132.4	141.3	142.7	146.4	147.2	148.8	148.8	150.1	150.2	150.5	152.7	155.8
Richmond, Va.	100.9	98.0	98.9	98.4	113.9	115.1	116.0	117.4	118.4	120.7	123.0	125.5	127.3	130.2	130.2	133.1	133.5	133.5	133.8	135.9
CINCINNATI: ‡																				
Louisville, Ky.	100.8	101.0	100.7	104.0	112.8	114.9	116.4	118.4	119.9	121.2	122.0	126.2	126.5	133.7	134.3	134.7	135.2	136.3	135.7	138.4
Cincinnati, Ohio	96.3	96.6	96.3	97.4	111.1	113.1	114.3	116.7	119.1	121.8	124.2	130.7	131.2	133.9	.....	134.6	137.7	138.2	138.3	138.2
Cleveland, Ohio	101.1	101.9	102.1	107.6	125.1	127.1	127.3	128.1	128.3	128.9	138.5	142.3	139.5	142.6	142.6	147.8	147.9	147.5	148.1	149.2
Memphis, Tenn.	104.7	102.5	101.2	104.0	115.8	117.9	118.6	118.9	120.1	120.1	121.7	133.7	134.4	134.4	135.3	135.6	136.0	136.9	137.7	139.9
INDIANAPOLIS: †																				
Indianapolis, Ind.	102.7	105.2	105.2	101.2	114.0	118.2	118.8	122.6	121.2	121.6	121.3	126.0	133.9	134.2	136.6	137.3	138.1	139.5	140.5	141.6
Detroit, Mich.	108.3	107.2	107.2	104.0	119.6	123.3	124.3	125.6	126.5	128.8	129.8	142.1	147.7	149.6	152.6	152.1	152.3	152.9	153.6	153.4
CHICAGO: *																				
Chicago, Ill.	100.0	100.3	99.1	99.4	106.7	106.7	108.9	108.9	109.1	109.5	110.3	111.3	112.3	112.0	112.0	112.4	112.4	112.6	115.3	117.2
Milwaukee, Wis.	106.7	107.0	106.2	107.9	120.7	124.4	131.6	132.0	131.5	131.5	133.9	137.9	141.3	142.3	142.1	142.4	142.3	144.4	145.8	146.9
DES MOINES: †																				
Des Moines, Iowa	101.6	101.6	101.8	102.0	113.8	115.2	116.7	116.7	116.3	116.1	116.1	116.0	118.3	118.4	121.1	120.9	120.7	120.8	120.8	121.4
St. Louis, Mo.	98.5	98.0	96.4	98.0	120.2	125.1	126.2	120.7	120.6	120.6	118.8	119.0	119.2	123.1	122.7	124.4	126.4	126.9	132.9	149.5
Fargo, N. D.	99.1	99.0	98.1	102.3	111.5	115.8	117.5	118.8	121.1	122.3	122.3	122.4	123.9	124.7	125.1	125.7	126.7	128.3	127.8	128.1
Sioux Falls, S. D.	105.1	104.0	100.8	101.4	117.4	119.4	124.2	124.7	124.3	126.2	126.2	126.5	127.7	127.7	130.4	130.8	130.8	131.9	133.0	133.1
LITTLE ROCK: ‡																				
Little Rock, Ark.	101.6	102.1	102.7	103.2	127.9	128.5	135.0	135.0	134.6	134.7	135.0	135.4	135.4	137.6	138.1	138.5	138.4	139.0	138.8	140.9
New Orleans, La.	102.3	101.2	101.4	105.3	128.5	128.9	131.9	131.9	131.3	131.3	131.4	138.4	141.3	141.2	141.2	141.7	141.9	141.9	141.9	142.7
Jackson, Miss.	105.1	103.3	103.0	105.1	122.6	122.7	122.7	122.7	123.4	123.5	123.9	129.2	132.3	136.8	137.2	137.2	137.2	139.0	139.2	141.1
Albuquerque, N. M.	103.0	103.5	103.5	104.8	116.6	117.6	117.7	117.5	117.0	117.7	118.7	130.9	133.8	133.9	130.9	132.0	124.7	132.0	132.3	132.5
Houston, Texas	100.6	100.7	100.2	99.9	119.5	116.1	115.9	116.6	116.2	116.2	116.5	121.5	123.1	123.6	126.7	126.8	126.4	126.8	126.8	128.6
TOPEKA: *																				
Denver, Colo.	101.0	101.4	99.8	98.9	112.4	112.2	113.4	112.9	112.9	112.9	115.9	119.6	120.1	122.5	122.8	125.3	128.0	128.2	127.3	129.1
Wichita, Kan.	109.1	108.0	107.7	103.9	124.4	125.5	126.5	127.5	127.5	129.0	129.1	131.9	133.2	134.4	135.7	135.9	135.9	136.7	136.8	137.3
Omaha, Neb.	100.4	100.3	103.1	105.5	124.2	125.5	126.5	126.7	126.4	126.3	126.4	129.6	131.2	133.3	134.0	134.5	136.2	137.2	137.3	139.9
Oklahoma City, Okla.	104.7	104.3	104.9	106.8	125.4	127.7	131.8	132.2	133.0	133.3	144.3	147.1	148.2	149.4	149.4	151.3	151.3	151.4	151.5	153.3
PORTLAND: †																				
Boise, Idaho	103.8	104.6	103.4	103.8	121.2	126.2	126.0	126.0	125.9	126.4	126.9	127.2	133.1	136.8	137.1	139.1	138.1	138.1	138.9	138.9
Portland, Ore.	98.6	94.8	95.4	97.0	113.6	115.1	120.1	127.0	133.9	133.0	132.6	132.0	138.5	140.9	140.9	143.6	143.4	143.4	141.5	142.4
Salt Lake City, Utah	100.5	103.0	102.8	102.5	118.3	119.6	120.1	120.1	119.7	122.8	122.9	122.3	123.3	126.8	126.8	129.7	129.7	129.1	129.5	130.4
Seattle, Wash.	102.2	102.7	101.9	102.8	122.7	123.8	122.1	122.1	124.4	126.6	131.0	132.5	131.9	133.7	134.6	138.9	138.9	138.9	139.6	135.3
LOS ANGELES: ‡																				
Phoenix, Ariz.	98.3	96.5	97.9	99.4	110.3	112.9	111.8	111.8	111.4	111.5	111.5	112.5	118.5	118.0	122.0	122.0	122.3	122.4	122.3	121.9
Los Angeles, Calif.	98.2	96.0	95.0	96.3	114.9	120.3	128.1	129.9	130.9	132.9	133.5	141.6	146.5	148.2	148.9	151.3	150.9	151.4	151.9	153.7
San Francisco, Calif.	103.8	103.1	102.5	102.3	119.0	121.6	121.6	.....	.....	.....	.....	.....	128.4	134.5	134.5	135.8	135.8	136.3	136.1	136.5
Reno, Nevada	102.3	102.1	102.3	104.3	116.1	117.5	118.2	119.9	119.2	120.6	120.7	119.9	124.6	127.5	133.0	132.9	133.0	133.0	133.1	133.5

* Boston, Winston-Salem, Chicago, Topeka reporting dates: March, June, Septeml er, December. †New York, Indianapolis, Des Moines, Portland reporting dates: January, April, July, October
‡ Pittsburgh, Cincinnati, Little Rock, Los Angeles reporting dates: February, May, August, November.



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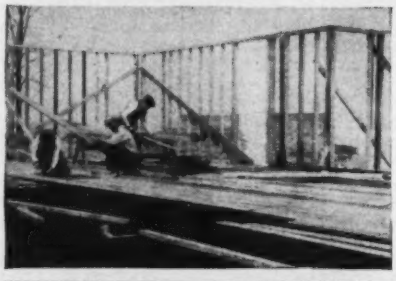

JOISTS AND FLOORING. Pressure-treated wood for joists and flooring gives low-cost protection against termites and decay.

FRAMES AND SUPER STRUCTURE. Pressure-treatments now available give a high degree of fire-retardance to the wood, as well as guarding it against insect and fungus attack.

To

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EXTEND LIFE

In the big construction program that's just ahead, Koppers Pressure-Treated Wood can help you get *more* for your money, give you new opportunities in designing for top utility.

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The illustrations suggest some of the many places where engineers are profitably using pressure-treated wood. Many others are illustrated in our bulletin, "Economical and Permanent Construction with Pressure-Treated Wood." We will be glad to send you a copy. Wood Preserving Division, Koppers Company, Inc., Koppers Building, Pittsburgh 19, Pa.

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PRESSURE-TREATED WOOD

a KOPPERS Product

Contract Unit Bid Prices

Selected list of 57 projects showing how contractors bid in 1945-1946

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HIGHWAY REPAIR, CALIFORNIA

OWNER: California Division of Highways, Sacramento, Calif.; G. T. McCoy, state highway engr.

PROJECT: Repairing 13.0 miles (portions only) of highway with untreated rock base and plant-mix surfacing between 1.7 miles east of San Luis Creek and Los Banos and between 1.7 miles north of Romero School and Los Banos in Merced County, Calif.

CONDITIONS: Contractor to furnish all materials except mineral aggregate which will be furnished by the State. Highway transportation facilities available. Time for completion is 125 days. Wage rates stipulated are: skilled labor, $1.50 per hour; semi-skilled, $1.00; and common, 90c.

BIDS: Seven bids were received May 16, 1945 ranging from the low of $179,847 to $239,153. The low bid was irregular, however, and the contract was awarded to the second low bidder at $180,748.

PARTIAL LIST OF BIDDERS:

1. Frank B. Marks & Sons and W. C. Railing, Redwood City, Calif. (irregular) $179,847
2. Louis Biasotti & Son, Stockton, Calif. (contract award) 180,748
3. N. M. Ball Sons, Berkeley, Calif 190,392

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Border trenching	13.03 mi.	$270.00	$225.00	$183.00
2. Develop water supply and furnish waterline equipment	Lump Sum	750 00	300 00	500.00
3. Applying water	3,500 M gal.	1.50	1.50	1.45
4. Imported borrow	4,200 c. y.	1 00	.85	.98
5. Untreated rock base	74,100 ton	1 34	1 28	1 52
6. Liquid asphalt, MC-2	340 ton	23 00	22.00	20.50
7. Sand cover	420 ton	2.50	4.50	2.00
8. Handling mineral aggregate	22,200 ton	1 75	1 95	1.83
9. Paving asphalt	1,000 ton	17 00	18.50	15.20
10. Asphaltic emulsion (seal coat)	33 ton	30 00	36.00	28.00
11. Screenings (seal coat)	250 ton	4.50	6.00	4.50

HIGHWAY GRADING, ADVANCE CLEARING, WASHINGTON

OWNER: Public Roads Administration, Bedell Building, Portland Oregon. W. H. Lynch, division engineer.

PROJECT: Grading and advance clearing for the Republic-Kettle Falls highway, Colville National Forest, Ferry County, Washington; including 121,500 cu. yds. of unclassified excavation and the finishing of 2.125 mi. earth-graded roads.

CONDITIONS: Contractor to furnish all materials and complete work in 175 days. Rail and highway transportation facilities available. Wage rates specified are: skilled; $1.85; semi-skilled, $1.40; and common, $1.00 per hr.

BIDS: Six bids were received on Nov. 1, 1945, ranging from the contract low of $108,360, to $132,247.

LIST OF BIDDERS:

1. E. W. Elliott, Seattle (contract) $108,360
2. C. E. Oneal, Ellersburg, Wash. 109,986
3. Colonial Constr. Co., Spokane 119,355
4. M. J. Kuney Co., Spokane 127,431
5. Goetz & Brennan, Seattle 129,505
6. Goodfellow Bros., Inc., Wenatchee, Wash. 132,247

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Extra and misc. force account work	All	$500 00	$500 00	$500 00
2. Clearing	29 acres	200 00	500 00	300 00
3. Grubbing	15 acres	300 00	200 00	150 00
4. Selected removal trees and snags	200 s. f.	2 00	4 00	4 00
5. Unclassified excavation	121,500 c. y.	0 70	0 65	0.80
6. Unclassified excavation, structures	350 c. y.	2 00	3 00	3 00
7. Unclassified excav., borrow, case 1	1,000 c. y.	0 70	0 40	0.80
8. Overhaul (1000-ft. free haul)	33,000 sta. y.	0 03	0 02	0.02
9. Spec. overhaul, borrow (1000-ft. free haul)	300 c. y. m.	0.20	0.18	0.20

(Continued on following page)

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HIGHWAY GRADING, WASHINGTON

(*Continued from preceding page*)

10. Roadside cleanup	4 acres	300.00	400.00	300.00
11. Finish earth graded roads	2.125 mi.	800.00	500.00	600.00
12. Cement rubble masonry	8 c. y.	20.00	20.00	25.00
13. Bituminous coated corrugated sht. met. culv. pipe, Type 1, 18-in.	1,100 l. f.	3.00	3.00	4.00
14. Bit. etd. prf. corr. glv. sht. met. pipe, underdrain, 8-inch	50 l. f.	2.00	2.00	2.20
15. Paved culvert inlets, Type 1	30 a. y.	10.00	6.00	5.00

HIGHWAY CONSTRUCTION IN OREGON

Clearing

OWNER: Oregon State Highway Commission, Salem, Oregon. Mr. R. H. Baldock, state highway engineer.

PROJECT: Circle Bridge-Hug Point Section, Oregon Coast Highway. 7.41 miles or approximately 164 acres of highway right of way clearing.

CONDITIONS: Contractor to complete project in 240 calendar days. Minimum wage rates are: Skilled Labor $1.25 per hour, Intermediate Labor, Group 1, $1.15 per hour; Intermediate Labor, Group 2, $1.00, Common Labor, $0.85 per hour.

BIDS: Six bids were received October 29, 1945, ranging from $119,500.00 to $258,750.00.

PARTIAL LIST OF BIDDERS:

1. J. R. Maginnis, Portland, Oregon $119,500.00
2. Grimstead and Vandervelt, Astoria, Oregon 133,000.00
3. Heavy Hauling Company, Astoria, Oregon 151,200.40

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. Clearing	Lump Sum	$116,000.00	$130,000.00	$138,842.40
2. Extra clearing	5 acres	600.00	500.00	846.60
3. Felling danger trees	500 sq. ft.	1.00	1.00	16.25

Grading

PROJECT: Troutdale-Wahkenna Creek Section, Columbia River Highway. 2.49 miles of grading, requiring approximately 206,000 cubic yards Borrow Excavation; 231,000 cubic yards Roadbed Excavation, and 7,000 cubic yards Channel Change Excavation.

CONDITIONS: Contractor to furnish all materials and complete project in 300 calendar days. Minimum wage rates are: Skilled Labor $1.25 per hour; Intermediate Labor, Group 1, $1.15 per hour; Intermediate Labor, Group 2, $1.00 per hour, and Common Labor $0.85 per hour.

BIDS: Eleven bids were received October 29, 1945, ranging from $149,705 to $198,255.

PARTIAL LIST OF BIDDERS:

1. Leonard and Slate Oregon, Ltd., Portland $149,705
2. Berke Bros., Portland 150,192
3. R. A. Heintz Construction Co., Portland 158,896

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. Clearing and grubbing	All Specified	$10,000	$17,800	$12,500
2. Structural excavation	60 cu. yds.	4.00	2.00	3.00
3. Trench excavation	600 cu. yds.	1.50	2.00	2.00
4. Borrow excavation	206,000 cu. yds.	0.20	0.19	0.22
5. General excavation, location "A"	213,000 cu. yds.	0.20	0.19	0.225
6. General excavation, location "B"	12,000 cu. yds.	0.20	0.19	0.30
7. General excavation, location "C"	6,000 cu. yds.	0.50	0.19	0.30
8. Channel change excavation	7,000 cu. yds.	0.70	1.00	1.00
9. Short overhaul	1,900,000 yd. stas.	0.01	0.01	0.01
10. Long overhaul	40,000 "C" yd. stas.	0.40	0.35	0.30
11. Rounding cutbanks	7,000 lin. ft.	0.10	0.10	0.15
12. Finishing roadbed and slopes	2.49 mile	500.00	300.00	250.00
13. 18" cor. met. pipe, protect. invert	440 lin. ft.	3.00	3.00	2.39
14. 24" cor. met. pipe, protect. invert	450 lin. ft.	4.00	4.00	3.85
15. 36" cor. met. pipe, protect. invert	130 lin ft.	10.00	7.50	7.50
16. Topsoiling, tractor and earryall	250 hours	11.00	9.00	11.00
17. Topsoiling with blade grader	50 hours	7.00	5.00	6.50

Surfacing and Oiling

PROJECT: Buchanan-Malheur River Section, Central Oregon Highway. 18.80 miles of surfacing and oiling; also furnishing 11,400 cubic yards of crushed rock in stockpiles. Requires approximately 82,700 cubic yards crushed rock, and 1,054 tons of asphaltic materials.

CONDITIONS: Contractor to furnish materials and complete project in 335 calendar days. Minimum wage rates are: Skilled Labor, $1.25 per hour; Intermediate Labor, Group 1, $1.15 per hour; Intermediate Labor, Group 2, $1.00 per hour; Common Labor, $0.85 per hour.

BIDS: Eight bids were received October 30, 1945, ranging from $235,479 to $334,426.

PARTIAL LIST OF BIDDERS:

1. Rogers Construction Co., Dayton, Wn. $235,479
2. E. C. Hall Co., Portland 236,020
3. Newport, Kern and Kibbe, Portland 247,960

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. 3½"-2" rock in base	38,000 cu. yds.	$2.10	$2.10	$2.30
2. ¾"-0" rock in base & shoulders	21,000 cu. yds.	2.25	2.10	2.39
3. Sprinkling	1,400 M-gals.	3.00	2.50	3.50
4. Preparation of base	18.77 miles	100.00	125.00	100.00
5. Furnish and place aggregates	12,300 cu. yds.	3.00	3.40	2.84
6. Furnish and place 151-200 asphalt	820 tons	33.00	32.00	33.46
7. Furnish and place RC 3 or emuls.asph.	234 tons	33.00	32.00	31.70
8. ¾"-1¼" crushed rock in stockpiles	4,560 cu. yds.	2.55	2.59	2.49
9. ½"-1½" crushed rock in stockpiles	3,420 cu. yds.	2.55	2.59	2.49
10. ¼"-0" crushed rock in stockpiles	3,420 cu. yds.	2.55	2.59	2.49
11. Clearing and grubbing stockpile sites	Lump Sum	800.00	600.00	1,000.00
12. Leveling of stockpile sites	Lump Sum	800.00	600.00	1,000.00

Bituminous Macadam Surfacing

PROJECT: Madras-Juniper Butte Section of The Dallas-California Highway. 10.41 miles of bituminous macadam surfacing. Requires approximately 26,200 cubic yards pit-run gravel topping; 88,000 cubic yards crushed rock, and 1,128 tons of asphaltic materials.

CONDITIONS: Contractor to furnish all materials and complete project in 365 calendar days. Minimum wage rates are: Skilled Labor $1.25 per hour; Intermediate Labor, Group 1, $1.15 per hour; Intermediate Labor, Group 2, $1.00 per hour; Common Labor, $0.85 per hour.

BIDS: Fifteen bids were received October 29, 1945, ranging from $226,311 to $347,667.

PARTIAL LIST OF BIDDERS:

1. J. N. & M. J. Conley, Portland $226,311
2. Rogers Construction Co., Dayton, Wash. 239,088
3. Newport, Kern & Kibbe, Portland 264,626

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. Selected Roadbed Topping	26,200 cu. yds.	$0.30	$0.58	$0.43
2. Hauling Roadbed Topping	76,200 yd. miles	0.09	.10	0.125
3. 4½"-2" rock in base	42,500 cu. yds.	1.75	1.95	2.26
4. ¾"-0" rock in base and shoulders	30,000 cu. yds.	1.90	1.95	2.26
5. Sprinkling	2,000 M-gals.	2.75	2.50	2.00
6. Preparation of base	10.41 miles	175.00	100.00	100.00
7. Hauling and placing aggregates	800 cu. yds.	1.35	1.40	1.30
8. Furnishing and placing aggregates	15,500 cu. yds.	2.70	2.50	2.84
9. Furnish and plac 121-150 asphalt	980 tons	26.50	25.50	26.56
10. Furnish and plac RC-3 oremulsi. asph.	148 tons	27.00	27.00	26.05

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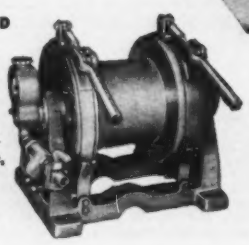

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HIGHWAYS, OREGON

OWNER: Oregon State Highway Dept., Salem, Ore.

PROJECT: Bridge construction, furnishing gravel, grading, and bituminous macadam surfacing 4.36 miles of the Coyote Creek-Graves Creek section of Pacific Highway, Josephine County, Ore. Involves construction of two concrete bridges, four concrete box culverts, two timber bridges, furnishing gravel in stockpiles, in addition to highway surfacing.

CONDITIONS: Contractor to furnish all materials. Highway transportation available to site. Wage rates specified are: skilled labor $1.20 per hour; semi-skilled, 75 to 90c.; and common, 62½c.

BIDS: Twelve bids were received May 15, 1945, ranging from the contract low of $601,501 to $984,637.

LIST OF BIDDERS:

1. McNutt Brothers, Eugene, Ore. (contract) $601,501
2. G. F. Atkinson, San Francisco, Calif. 662,230
3. K. L. Goulter, Seattle, Wash. 664,865
4. Larson Bros. & Harms Bros., Sacramento, Calif. 678,264
5. E. C. Hall Co., Portland, Ore. 692,404
6. Kuckenberg Constr. Co., Portland, Ore. 728,657
7. E. B. Bishop, Orland, Calif. 771,784
8. Leonard & Slate Oregon, Ltd., Portland, Ore. 772,185
9. Guerin Bros., San Francisco, Calif. 805,489
10. Peter Kiewit Sons Co., Omaha, Nebr. 820,065
11. Morrison-Knudsen Co., Boise, Idaho 887,516
12. E. J. Eldon, Portland, Ore. 984,637

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and cleaning-up	70 ac.	$335 00	$350 00	$250 00
2. Grubbing	30 ac.	335 00	150.00	250 00
3. Extra clearing	19 ac.	350 00	250 00	300 00
4. Extra grubbing	3 ac.	350 00	200.00	300 00
5. Felling dangerous trees	200 s. f.	1 00	4 00	3 00
6. Shoring, cribbing, etc.	Lump Sum	2,100 00	10,000.00	1,600 00
7. Structural excavation	540 c. y.	4 00	4 00	6.00
8. Struct. excavation, below specified elevations	50 c. y.	4 00	10 00	13 00
9. Trench excavation, unclassified	3,200 c. y.	2 00	2 25	2.00
10. General excav., Locations "A", unclassified	590,000 c. y.	.30	40	.38
11. General excav., Sta. 326 to 332 + 60, unclassified	100,000 c. y.	.35	46	.38
12. Gen. excav., Sta. 342 to 344, unclassified	25,000 c. y.	.35	40	.38
13. As above, Sta. 356 to 373	100,000 c. y.	35	45	.38
14. As above, Sta. 412 to 448 + 00	48,000 c. y.	30	39	.38
15. Short overhaul	2,700,000 st. yd.	01	004	.01
16. Long overhaul	74,000 st. yd.	24	.25	.40
17. Rounding cutbanks	15,000 l. f.	.10	10	.15
18. Finishing roadbed and slopes	4.36 mi.	500.00	250 00	1,000.00
19. 9-in. perf. corr. metal pipe	1,800 l. f.	2.00	1 35	1.10
20. 6-in. perf. concrete pipe	1,200 l. f.	53	50	.60
21. 10-in. perf. concrete pipe	2,100 l. f.	92	90	1.10
21. 12-in. perf. concrete pipe	660 l. f.	1 17	1.10	1.50
22. 18-in. concrete pipe	1,120 l. f.	2 27	2 40	2 70
23. 24-in. concrete pipe	1,300 l. f.	3 35	3.30	4.00
24. 30-in. concrete pipe	290 l. f.	5 43	5 50	6.50
25. 18-in. extra str. conc. pipe	330 l. f.	2 50	2 80	3.30
26. 24-in. extra str. conc. pipe	420 l. f.	3 66	4 00	4.80
27. 30-in. extra str. conc. pipe	220 l. f.	6 00	6.00	7 00
28. Std. conc. catch basin	1 ea.	50 00	250.00	200.00
29. Spec. concrete catch basins	1 ea.	50 00	250.00	250.00
30. Gravel backfill in drains	1,300 c. y.	3 00	2.90	4.00
31. Wood sight posts	170 ea.	4.00	4.50	4.00
32. Class A conc. in slab, bridge and box culverts	510 c. y.	46.50	40.00	40.00
33. Cl. A conc. in Grave Creek bridge	740 c. y.	43 00	42 50	43 00
34. Metal reinforcement	214,000 lb.	0625	06	0775
35. Metal handrail	620 l. f.	9 00	5 75	6.75
36. Detour bridge	Lump Sum	7 500 00	11,500 00	6,800 00
37. Untreated lumber, in place	2.5 M bm.	125 00	160 00	140 00
38. 2"-0" gravel in base	14,500 c. y.	2 00	2 00	2.25
39. ¾"-0" gravel in base and shoulders	13,000 c. y.	2 50	2.30	2.70
40. Add'l. ¾"-0" gravel in key course	4,000 c. y.	3 00	2 50	2.40
41. Filler	200 c. y.	80	75	.35
42. Hauling filler	400 y. mi.	10	20	.12
43. Sprinkling	1,300 M gal.	2 00	2.50	1.50
44. Preparation of base	4.36 mi.	150 00	200 00	200.00
45. Furn. and place aggregates	7,300 c. y.	3 50	3.10	3.40
46. Furn. and place 120-150 pen. asphalt	450 ton	28.50	24.00	27.00
47. Furn. and place RC-3 or emulsified asphalt	70 ton	28.50	28.00	27.00
48. ¾"-1½" cr. gravel in stockpile	600 c. y.	3.00	1.75	2.10
49. ¾"-1½" cr. gravel in stockpile	600 c. y.	3.00	2.00	2 10
50. ¾"-0" cr. gravel in stockpile	200 c. y.	3.00	2.50	2 10
51. Hauling crushed gravel (pile mean)	3,500 y. mi.	10	.15	.12

HIGHWAY PAVING, INDIANA

OWNER: State Highway Comn. of Indiana, Indianapolis; C. E. Vogelsang, engr.

PROJECT: Reinforced concrete pavement and resurfacing 5.617 miles of State Highway No. 24 in Allen County, Ind., from New Haven in a northeasterly direction.

CONDITIONS: Contractor to furnish all materials and complete work in six months. Highway transportation facilities available to site of work. Minimum wage rates specified are: skilled labor, $1.00 per hour; semi-skilled, 75c.; and common labor, 65c.

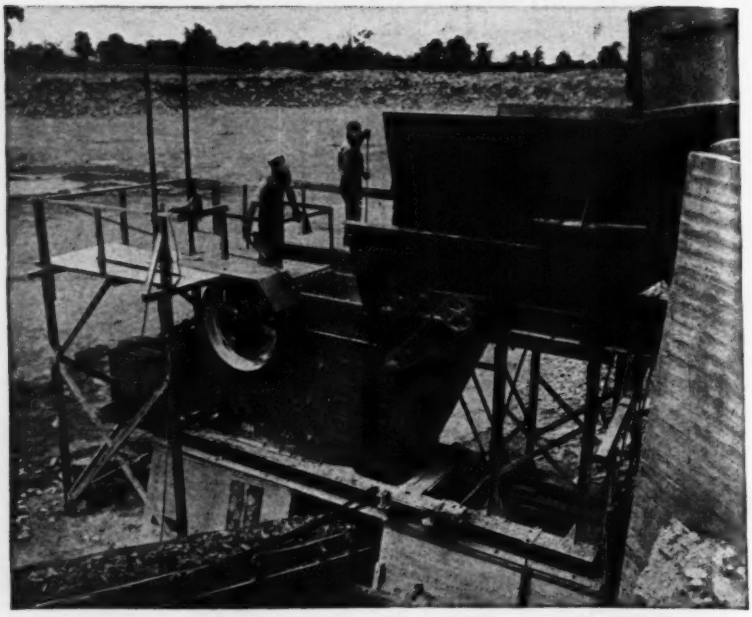
BIDS: Three bids were received June 19, 1945, ranging from the contract low of $364,861 to $399,669. Engineer's estimate, $379,910.

LIST OF BIDDERS:

1. Moellering Constr. Co., Fort Wayne, Ind. (contract) $364,861
2. Acme Construction Co., Inc., Fort Wayne, Ind. 369,677
3. Rieth-Riley Constr. Co., Goshen, Ind. 399,669

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, common	27,794 c. y.	$0.50	$0.40	$0.60
2. Excavation, waterway	280 c. y.	1.00	1.00	.60
3. Excavation, wet	1,071 c. y.	5.75	6.00	6.00
4. Special borrow	22,591 c. y.	.52	.55	.80
5. Grade B, special borrow	2,307 c. y.	1.65	1.50	2.00
6. Overhaul	1,931 c. y.	.07	.10	.10
7. Pavement removal	23,368 s. y.	.48	.50	.50
8. Salvaged pavement removal	11,684 s. y.	.48	.50	.50
9. Breaking concrete pavement	700 s. y.	.25	.25	.25
10. Finishing shoulders and ditches	30,645 l. f.	.31	.20	.30
11. 18-in. rein. concrete pipe	16 l. f.	3.50	3.50	3.50
12. 15-in. rein. conc., vitr. clay, cast iron or conc. pipe	348 l. f.	2 15	2.00	2.50
13. 18-in. as above	66 l. f.	2 50	2.50	3.00
14. 36-in. pipe relaid	75 l. f.	3.00	3.00	3.00
15. 6-in. vitr. clay sewer or cem. conc. sewer pipe	81 l. f.	1.00	1.00	1.00
16. Drain tile, 6-in., vit. clay or conc	540 l. f.	.55	.55	1.00
17. Vit. clay, cem. conc., or ext. quality drain tile for subsurf. drngc., 6-in.	17,014 l. f.	.55	.55	.60
18. Vit. clay or cem. conc. sewer pipe for subsurface drainage, 6-in.	348 l. f.	1.00	1.00	1.00
19. Aggregate for subsurface drainage (No. 7)	477 c. y.	3.00	3.25	4.00
20. Natural sand backfill for subsurface drainage (No. 14)	934 c. y.	2.50	2.50	2.50
21. Remove exist. struct., Sta. 6 + 15	Lump Sum	1,000.00	800.00	1,000.00
22. Remove exist. struct., Sta. 214 + 25	Lump Sum	800.00	1,000.00	1,000.00
23. Conc. for struct., spec. Cl. D	8.1 c. y.	42.00	40.00	50.00
24. Conc. for struct., Class D	30.6 c. y.	40.00	40.00	50.00
25. Conc. for struct. No. 11 and No. 20, Cl. D	150.2 c. y.	36.00	37.50	40.00
26. Conc. for structs. No. 11 and 20, Class E in footings	364.6 c. y.	32.00	30.00	32.00
27. Conc. for structs. No. 11 and 20, Class E above footing	244.2 c. y.	36.00	35.00	40.00
28. Furnish equipment for driving piles	Lump Sum	200.00	200.00	500.00
29. Timber piles furnished	3,360 l. f.	.38	.50	.60
30. Timber piles driven	2,690 l. f.	.47	.50	.60
31. Rein. steel for structures	56,658 lb.	.08	.08	.08
32. Reconstructed manhole	2.5 l. f.	25.00	10.00	10.00
33. Castings adjusted to grade	1 ea.	15.00	15.00	10.00
34. Catch basin, Type C-5	1 ea.	80.00	125.00	100.00
35. Special inlets	1 ea.	150.00	150.00	150.00
36. Reinforced concrete pavement	44,402 s. y.	2.60	2.55	2.70
37. Reinforced concrete resurface	31,028 s. y.	2.25	2.40	2.50
38. Concrete over-run	697 c. y.	12.00	13.50	12.50
39. Spec. rein. steel for rein. concrete resurface	29,566 lb.	.08	.10	.08
40. Reinforcing steel for pavement	1,229 lb.	.08	.10	.08
41. 1-in. fiber expansion joint	139 l. f.	.75	.80	1.00
42. Contraction joints for rein. concrete pavement	9,991 l. f.	.52	.65	.80
43. Contraction joints for rein. concrete resurface	6,981 l. f.	.52	.65	.80
44. Reconstructed concrete base	116.7 c. y.	27.00	27.00	40.00
45. Compacted aggregate surface	800 ton	4.00	2.50	4.00
46. Bituminous stabilized mixture, type A	1,123.3 ton	6.50	7.00	7.00
47. As above, type B	1,078.9 ton	6.25	6.75	7.00
48. Subgrade fine aggregate	252 ton	3.50	4.25	4.00
49. Subgrade treatment material	10,390 c. y.	1.80	2.25	2.00
50. 6-in. traffic lane stripe	5.855 mi.	300.00	300.00	500.00
51. Monument, type D	1 ea.	20.00	20.00	25.00
52. Remove flex. steel plate guard rail	224 l. f.	.50	.50	1.00
53. Reset. flex. steel plate guard rail	572 l. f.	1.00	1.00	2.00
54. Guide posts, Type A	28 ea.	3 20	2.00	3.00
55. Guide posts, Type B	50 ea.	3 00	2.00	3.00
56. Barricades, Type A	2 ea.	60 00	40.00	50.00
57. Barricades, Type B	9 ea.	60 00	40.00	50.00
58. X-10-R signs	2 ea.	65 00	30.00	50.00
59. X-13 signs	19 ea.	48 00	25.00	50.00
60. Prewarning signs	12 ea.	75.00	40.00	50.00
61. Bench mark post	1 ea.	22.50	20.00	25.00

This plant, with 25" x 40" Jaw Crusher and Apron Feeder, will produce 50 yards of 2-inch crushed rock per hour.



50 CU. YDS. or 500 CU. YDS.

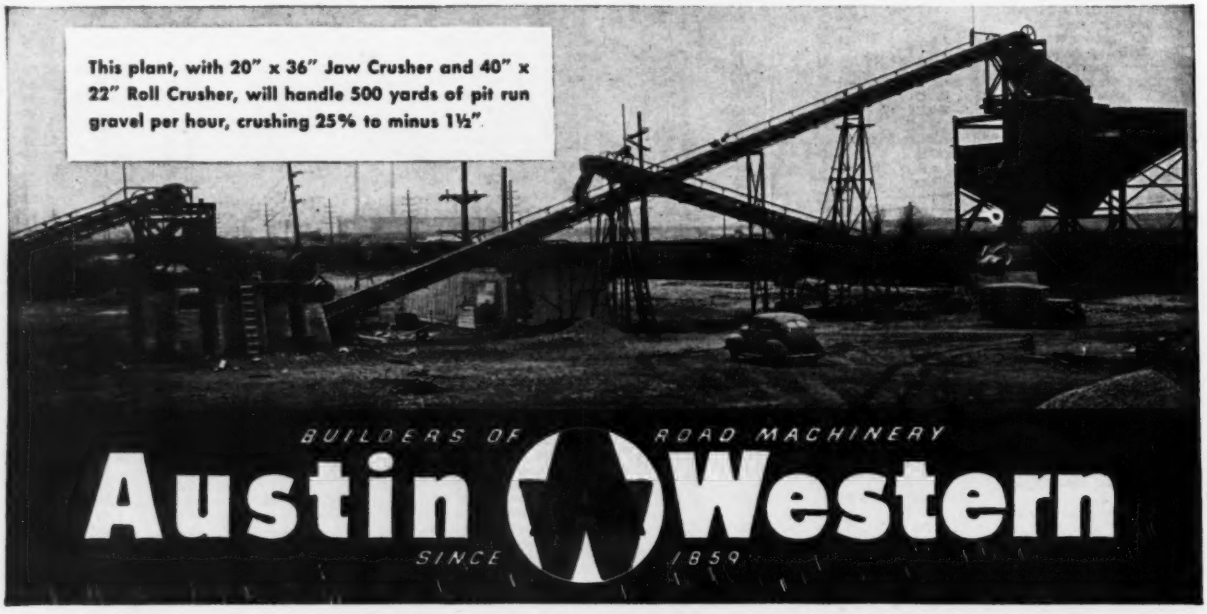
THE AUSTIN-WESTERN LINE OF CRUSHING EQUIPMENT INCLUDES:

Jaw Crushers and Roll Crushers in a wide range of sizes; plus matching screens, elevators, conveyors, and bins.

Semi-portable and portable crushing and screening plants, from the smallest to the magnificent two-unit and three-unit plants which combine maximum output with wide variety of specification; giving the owner flexibility of operation that spells maximum profits.

Your nearby Austin-Western distributor will be glad to recommend the plant or equipment best suited to your needs.

AUSTIN-WESTERN COMPANY, AURORA, ILL., U.S.A.


This plant, with 20" x 36" Jaw Crusher and 40" x 22" Roll Crusher, will handle 500 yards of pit run gravel per hour, crushing 25% to minus 1½".
BUILDERS OF ROAD MACHINERY
Austin Western
SINCE 1859

HIGHWAY IMPROVEMENT
HEMPSTEAD COUNTY, ARKANSAS

OWNER: Arkansas State Highway Department, Little Rock. Mr. N. B. Carver, engineer.

PROJECT: Highway improvement of 10.9 mi. between Hope and Lewisville, Hempstead County, Ark.; including grading, minor drainage structures and gravel base course.

CONDITIONS: Contractor to furnish all materials and complete work in 120 working days. Rail and highway transportation facilities available. Wage rates are: $1.00 per hr. for skilled labor; 65c. per hr. for semi-skilled; and 40c. per hr. for common labor.

BIDS: Seven bids were received on January 21, 1946, ranging from the contract low of $51,299.38 to $68,926.80.

LIST OF BIDDERS:

1. R. H. Davis, Stamps, Arkansas (contract) $51,299.38
2. D. F. Jones, Little Rock, Ark. 57,853.23
3. Reynolds & Williams, Tyler, Tex. 59,946.16
4. Graves Bros., Hamburg, Ark. 63,961.27
5. East Arkansas Construction Co., Jonesboro, Ark. 65,925.05
6. Mears Construction Co., Osceola, Ark. 66,795.88
7. R. DeLaughter, Prescott, Ark. 68,926.80

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	1,000 acres	$150.00	$100.00	$100.00
2. Grubbing	1,000 acres	75.00	100.00	100.00
3. Common excavation	2,346 cu. yd.	.30	.40	.52
4. Dry excavation for structures	594 cu. yd.	2.00	2.00	2.75
5. Wet excavation for structures	228 cu. yd.	4.00	3.00	2.75
6. Embankment material	15,295 cu. yd.	.32	.39	.50
7. Overhaul compacting	500 sta. yd.	.02	.02	.02
8. Earthwork gravel base	15,295 cu. yd.	.03	.02	.10
9. Course (Cl. B-8)	19,446 cu. yd.	1.00	1.15	1.05
10. Class "A" Concrete	428.24 cu. yd.	37.50	30.00	33.00
11. Class "B" Concrete	16.89 cu. yd.	35.00	30.00	35.00
12. Reinforcing steel	38,793 lb.	.045	.08	.06
13. Reinforced concrete pipe, culvert 18 in.	92 lin. ft.	3.00	3.00	2.50
14. Reinforced concrete pipe, culvert 24 in.	64 lin. ft.	3.50	4.00	3.50
15. Reinforced concrete pipe, culvert 30 in.	16 lin. ft.	5.00	6.00	5.00
16. Relaying culvert pipe	18 lin. ft.	1.50	1.50	2.00
17. Concrete spillways	1.68 cu. yd.	35.00	40.00	20.00
18. Solid sodding	16,000 sq. yd.	.25	.40	.35
19. Remove existing bridges	2 each	200.00	250.00	75.00

HIGHWAY RESURFACING
MARYLAND

OWNER: State Roads Comn. of Maryland. Baltimore; Wilson T. Ballard, chief engineer.

PROJECT: Asphaltic concrete resurfacing Baltimore-Washington Boulevard from a point four miles south of Dead Man's Curve Relocatoin to Laurel, Howard County, Md. Consists of placing 2½-in. asphaltic concrete base course and 1½-in. asphaltic concrete wearing course on existing roadway approximately 40-ft. wide for a length of four miles.

CONDITIONS: Contractor to furnish all materials and complete project in 110 working days. Rail and highway transportation facilities available. Very heavy traffic to be maintained, therefore, surfacing is to be placed in half sections. Minimum wage rates specified are: skilled labor, 70c. per hour; semi-skilled, 55c. per hour; and common, 40c. per hour.

BIDS: Three bids were received May 15, 1945 ranging from $158,790 to $162,289 (using slag in base and wearing courses); and from $171,786 to $175,969 (using stone in base and wearing courses).

LIST OF BIDDERS:

1. American Paving & Cont'g. Co., Baltimore, Md. (Low Bidder) ..... (Slag) $158,790
   (Stone) 171,786
2. T. B. Gatch & Sons, Inc., Baltimore, Md. .... (Slag) 162,161
   (Stone) 175,476
3. E. Stewart Mitchell, Baltimore, Md. ..... (Slag) 162,289
   (Stone) 175,969

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Class 1 excavation	3,000 c. y.	$1.25	$1.00	$1.25
2. Class 2 excavation	1,300 c. y.	1.50	1.50	1.75
3. Borrow excavation	300 c. y.	1.00	1.00	.25
4. Tamped fill	150 c. y.	1.00	1.00	1.25
5. Remove exist. concrete pavement (shoulder area)	100 s. y.	1.50	1.00	1.00
6. Remove existing masonry	15 c. y.	10.00	7.50	5.00
7. Calcium chloride	18 ton	45.00	40.00	40.00
8. Sub-base, Type 2	600 c. y.	1.75	1.50	2.50
9. Penetr. macadam base course	600 ton	4.00	3.50	3.00
10. Bitum. mat'l. for penetr. macadam base course	4,350 gal.	.13	.11	.09
11. Gravel surf. course for shoulder stabilisation	16,200 s. y.	.45	.55	.40
12. Asphaltic conc. wear. course, Spec. B, using stone	9,700 ton	5.70	5.84	6.00
13. Asph. conc. wear. crse., Spec. B, using slag	8,730 ton	5.70	5.84	6.00
14. Asp. conc. base crse., Spec. B, using stone	13,100 ton	5.70	5.84	6.00
15. Asph. conc. base crse., Spec. B, using slag	11,790 ton	5.70	5.84	6.00
16. Bitum. mat'l. for tack coat	15,800 gal.	.12	.11	.12
17. 6-in. pipe underdrain outlets	100 l. f.	1.00	.50	.50
18. 10-in. pipe underdrain outlets	70 l. f.	1.20	1.00	1.20
19. 6-in. perf. pipe underdrain	3,200 l. f.	.60	.45	.50
20. 10- in. perf. pipe underdrain	1,400 l. f.	.90	.80	1.00
21. 15- n. pipe	6 l. f.	2.50	2.00	2.00
22. 18 in. pipe	238 l. f.	2.75	2.50	2.25
23. 30-in. pipe	41 l. f.	5.00	10.00	8.00
24. 6x18-in. rein. conc. wye branch	1 ea.	30.00	20.00	25.00
25. Cl. A. conc. pipe endwalls	8 c. y.	40.00	45.00	45.00
26. Cl A. concrete using regular cement	15 c. y.	40.00	45.00	45.00
27. Reinforcing steel bars	1,350 lb.	.10	.08	.10
28. Aggregate bkfill. for underdrain	1,040 c. y	3.40	3.50	3.50
29. Drilled holes	30 l. f.	2.00	2.00	3.00
30. Portland cem. conc. gutter, 5-in. (Cl. A conc., reg. cement)	100 s. y.	2.70	3.25	3.30
31. As above, 8-in.	100 s. y.	3.60	3.50	4.50
32. Patch 9-in. conc. pavmt. (Cl. X early strength cement)	2,000 c. y.	4.50	4.50	4.50
33. Maintenance of traffic	Lump Sum	3,000.00	4,000.00	1,500.00

HIGHWAY, TEXAS

OWNER: Texas State Highway Comn., Austin.

PROJECT: Hot-mix asphaltic concrete paving 9.208 miles of U. S. Highway 69 in Hunt County, Tex., from 3.1 miles south of Greenville to Rains County Line (Sections).

CONDITIONS: Contractor to furnish all materials and complete work in 120 working days. Rail and highway transportation facilities available. Wage rate minimums specified are: skilled labor, $1.00 per hour; semi-skilled, 75c.; and common, 50c.

BIDS: Four bids were opened February 28, 1945, ranging from the contract low of $138,292 to $143,265.

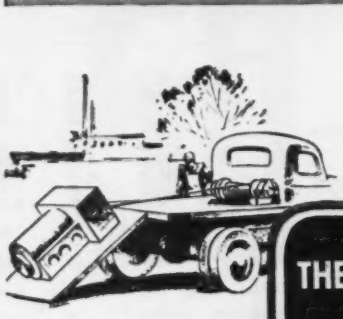
LIST OF BIDDERS:

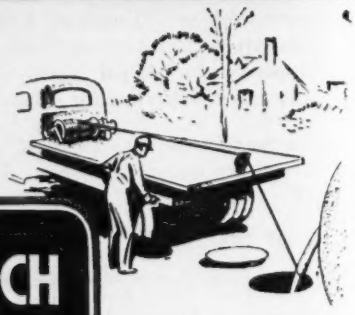
1. Texas Bitulithic Co., Dallas, Tex. (contract) $138,292
2. Uvalde Construction Co., Dallas, Tex. 140,331
3. Brown & Root, Inc., Houston, Tex. 142,915
4. Gaylord Construction Co., Houston, Tex. 143,265

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Type E (modified) aggregate	5,620 ton	$4.71	$4.64	$5.05
2. Local sand aggregate	20,100 ton	3.79	3.90	4.00
3. Asphalt	1,841 ton	18.00	18.20	17.10
4. Tack coat	14,737 gal.	.17	.16	.18

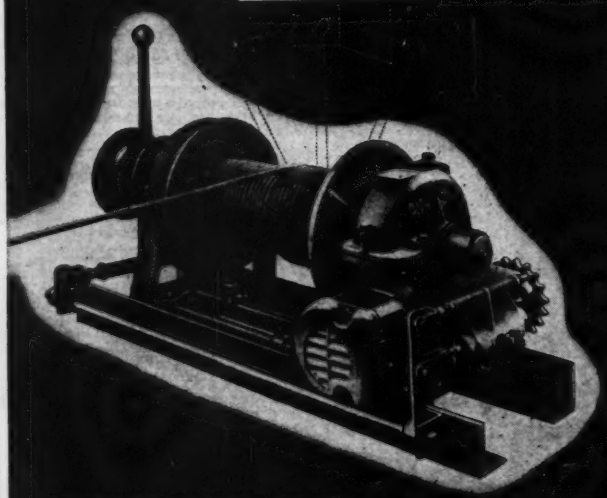
GAR WOOD *Presents*

THE WORLD'S MOST MODERN WINCHES





THE NEW *RAPID REVERSE* WINCH



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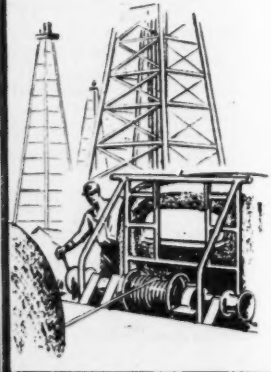

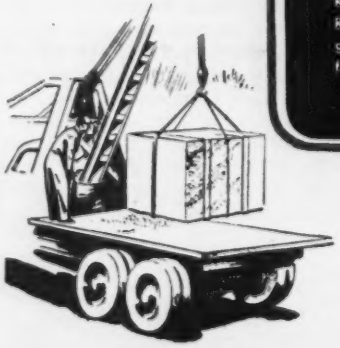

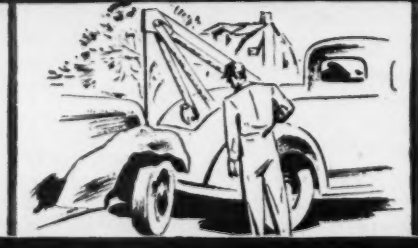

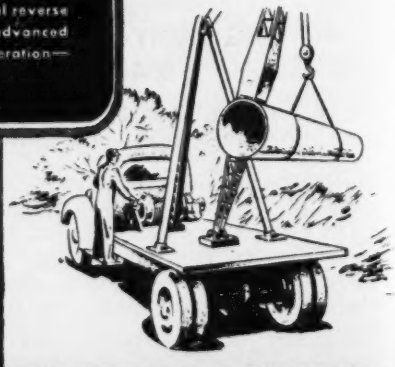

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HIGHWAY IMPROVEMENTS NEW YORK

OWNER: New York Dept. of Public Works, Albany.

PROJECT: Resurfacing portion of highway (28.61 miles) from Pennsylvania State Line through Westfield, Brocton, Fredonia and Silver Creek in Chautauqua County, N. Y., with bituminous macadam on concrete base (bituminous macadam mixing method optional). Thickness of bituminous macadam top course 2-in. and variable. Work also involves concrete base widening.

CONDITIONS: Contractor to furnish all materials and complete work by October 1, 1945. Rail and highway transportation facilities available. Wage rates specified are: skilled labor, 85c. to $1.625 per hour; semi-skilled, 85c. to $1.625; and common labor, 85c. to $1.25. On this project, however, the contractor is seeking permission to pay higher rates than those stipulated because of inability to obtain men at the stated rates.

BIDS: Thirteen bids were received April 11, 1945 ranging from the contract low of $583,323 to $714,472. Engineer's estimate $763,977. Awarded April 16, 1945.

LIST OF BIDDERS:

1. Warren Bros. Roads Co., Cambridge, Mass. (contract) $583,323
2. D. W. Winkelman Co., Inc., Syracuse, N. Y. 589,296
3. Louis Mayersohn, Albany, N. Y. 607,304
4. Bero Engr. & Constr. Corp., Buffalo, N. Y. 620,662
5. Bison Contracting Corp., Buffalo, N. Y. 622,936
6. Depew Paving Co., Depew, N. Y. 623,604
7. Fago Construction Co., Buffalo, N. Y. 624,948
8. Allegheny Asphalt & Paving Co., Pittsburgh, Pa. 649,487
9. Baldwin Bros. Paving Co., Erie, Pa. 652,377
10. Mohawk Paving Co., Inc., Buffalo, N. Y. 662,521
11. John B. Schultz Cont'g. Co., Inc., Buffalo, N. Y. 667,043
12. Lane Construction Co., Meriden, Conn. 704,498
13. Del Balso & Sprague, Inc., New York, N. Y. 714,472

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	17,300 c. y.	$0.30	$0.40	$0.80
2. Borrow excavation	19,400 c. y.	.75	.65	1.00
3. Trim shoulders	144,495 l. f.	.055	.05	.05
4. Preparing fine grade	65,245 s. y.	.20	.20	.20
5. Portland cement	20,445 bbl.	2.15	2.50	2.80
6. Concrete found'n. for pavmt.	14,480 c. y.	7.70	7.00	7.70
7. Top course, bitum. mat'l., mixing method optional	53,550 ton	6.57	6.50	6.60
8. Bitum. macadam asph. paving	14,200 gal.	.13	.11	.12
9. Maintain traffic for bit. macadam.	20,878 l. f.	.05	.10	.10
10. Maintain traffic for bit. macadam.	130,275 l. f.	.10	.20	.10
11. Protection of traffic	Lump Sum	10,500.00	10,500.00	10,500.00
12. Clean existing pavement	24.78 mi.	55.00	50.00	50.00
13. Bottom course, bitum. macadam, penetr. method	1,200 c. y.	6.00	6.00	6.60
14. Remove and store old street car rails	Lump Sum	330.00	300.00	330.00

GRADING, DRAINAGE, SURFACING WHATCOM COUNTY, WASHINGTON

OWNER: State Highway Department, Olympia, Wash.; Clarence Hickey, State Highway Director in charge.

PROJECT: Grading, drainage, surfacing plus removal of two bridges and 960 sq. yds. of existing concrete pavement. Work is on the Secondary State Highway, 1A, in Whatcom Co., Wash. and will include the laying 364 feet of concrete drainage pipe.

CONDITIONS: Contractor to furnish all materials and complete work in 90 calendar days. Highway transportation facilities available only. Wage rates stipulated as minimums are $1.60 to $1.70 per hour for skilled labor; $1.15 to $1.40 for semi-skilled; and the reasonably high figure of $1.15 per hour for common labor.

BIDS: Nine bids were received on April 3, 1945. The nine bids ranged from the contract low of $30,731 to $40,919.

LIST OF BIDDERS:

1. G. J. Norris, Seattle, Wash. (Contract) $30,731
2. P. J. Anderson & Sons, Seattle Wash. 30,953
3. Dawson Constr. Co., Bellingham, Wash. 31,700
4. C. V. Wilder Co., Bellingham, Wash. 33,290
5. Harrison Bros. Co., Tacoma, Wash. 33,507
6. A. Lind, Bellingham, Wash. 33,909
7. Romano Engineering Co., Seattle, Wash. 37,424
8. Beal & Roberts, Seattle, Wash. 37,727
9. A. W. Stevens Constr. Co., Mount Vernon Wash. ... 40,919

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	Lump Sum	$1,000.00	$1,200.00	$1,000.00
2. Unclassified excav., incl. haul.	25,560 c. y.	.75	.70	.70
3. Trench excavation, incl. haul.	80 c. y.	1.00	1.00	2.00
4. Structural excavation	230 c. y.	1.50	2.00	2.00
5. Slope treatment	2,675 ft.	.12	.20	.15
6. Finish roadway	23 stations 100 ft.	12.00	15.00	20.00
7. Sel. rdwy. borrow in pl., incl. haul	2,500 c. y.	1.00	.95	1.25
8. Sand filler in place, incl. haul.	110 c. y.	.75	3.00	2.00
9. Gravel backfill in place	110 c. y.	2.50	3.00	3.00
10. One course scr. grvl. surfg. in place	600 c. y.	2.00	3.00	2.50
11. Stand. guard rail, type 5, in place	915 ft.	.80	1.75	1.80
12. Stand. open wd. flume in place	110 ft.	1.00	1.50	1.00
13. Remove existing concrete pavement	960 s. y.	.25	.75	1.00
14. Remove 2 existing tbr. bridges	Lump sum	$2,000.00	$1,000.00	$1,100.00
15. 12-in. concr. or V. C. culv. pipe, in place	108 ft.	1.50	1.00	57.104
16. Stand. reinf. concr. culv. pipe, 24-in., in place	12 ft.	3.50	5.00	0.
17. 36-in. extra str. reinf. concrete culvert pipe in place	244 ft.	9.00	8.00	8.60

HIGHWAY SURFACING, NORTH DAKOTA

OWNER: North Dakota State Highway Department.

PROJECT: Surfacing 23.864 miles of highway and grading 4.744 miles; stabilized base 140,238 tons; procuring and laying 2,108 linear feet of reinforced concrete pipe culverts varying from 18 inches to 72 inches. Project located on U. S. Highway No. 10, near Glen Ullin, West in the counties of Morton and Stark, North Dakota.

CONDITIONS: Contractor to furnish all materials and complete work in 150-16 hour working days. Rail and highway transportation facilities available. Minimum stipulated wages are $.90 per hour for skilled labor; $.70 per hr. for semi-skilled; $.50 per hour for common.

BIDS: Six bids were received July 27, 1945. Ranging from the contract low of $505,214.04 to $693,192.74.

LIST OF BIDDERS:

1. Northern Improvement Co., Fargo, N. D. (contract) $505,214
2. Megarry Bro's., St. Cloud, Minn. 565,460
3. Inland Constr. Co., Omaha, Nebr. 601,909
4. W. H. Noel Co., Jamestown, N. D. 626,839
5. Northwestern Engr. Co., Rapid City, S. D. 627,424
6. Haggart Constr. Co., Fargo, N. D. 693,193

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Roadway excavation	284,496 c. y.	$.20	$.18	$.27
2. Water for compaction	3,749 m. gal.	1.00	2.50	.80
3. Scoria sub-base	10,113 c. y.	.50	1.00	1.18
4. Stabilized base	140,238 tons	1.45	2.00	1.76

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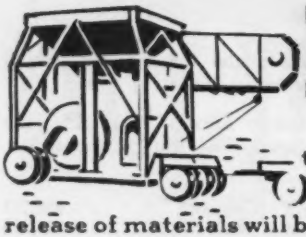

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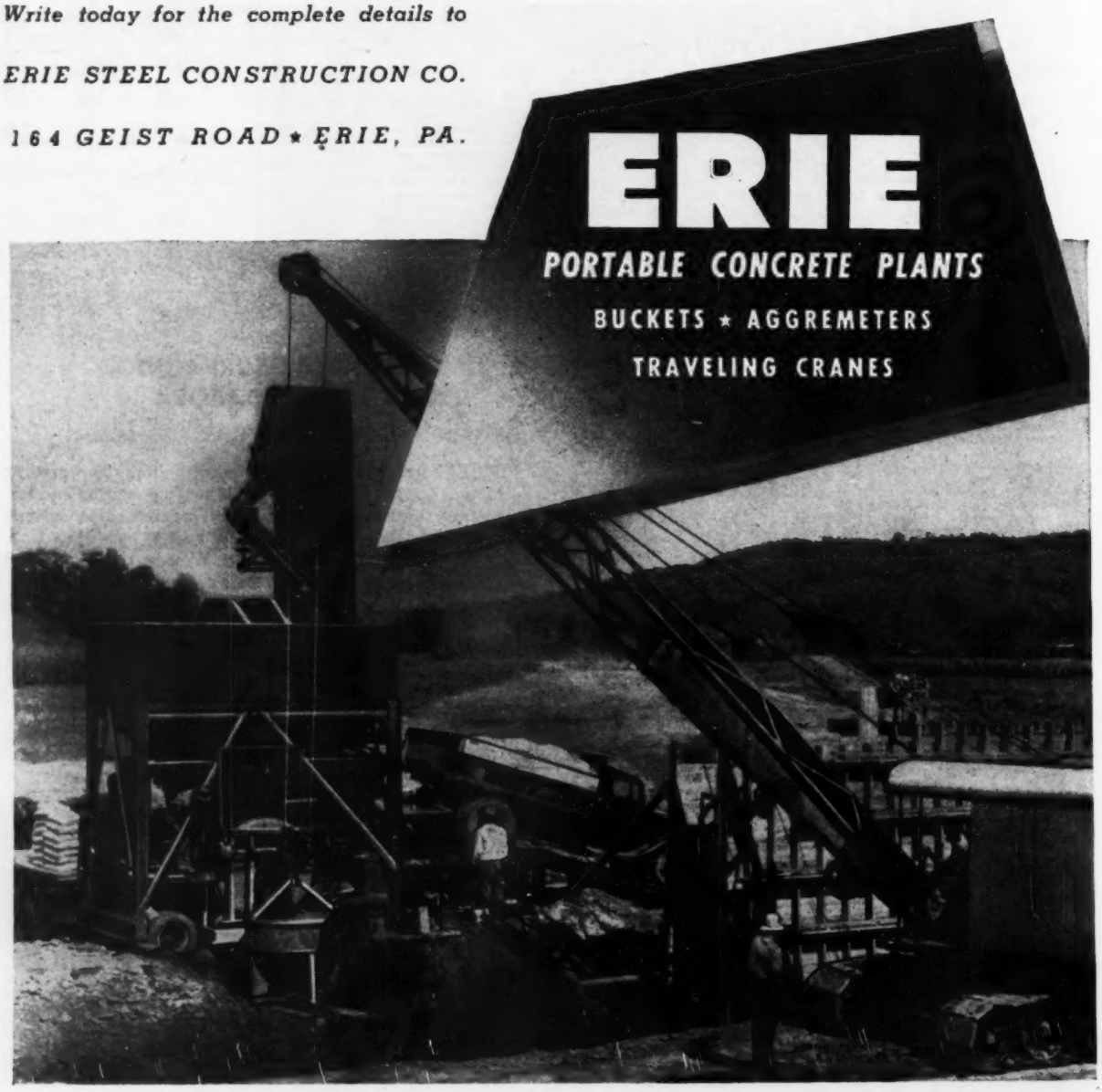
ERIE STEEL CONSTRUCTION CO.

164 GEIST ROAD ★ ERIE, PA.



HIGHWAY SURFACING, NORTH DAKOTA

(*Continued from preceding page*)

5. Furnish and apply bit. MC-1 or 2 (prime)	178,840 gals.	.11	.10	.13
6. Blotter sand	1,511.7 tons	2.00	2.00	1.60
7. Combined aggregate	36,267 tons	2.50	2.40	2.86
8. Furnish Bitumen MC-5 for mix	471,472 gals.	.17	.10	.11
9. Furnish & apply dit MC-5 for seal	149,922 gals.	.11	.11	.13
10. Seal aggregate, grabe 2	3,285.5 tons	5.00	4 00	5.60
11. Rip rap (cement joints)	390 s. y.	4.00	3 00	6.45
12. Concrete monument	1	10 00	10 00	10 00
13. Seeding (type C)	89.3 acres	15.00	12.00	42.00
14. Sodding	7,048 s. y.	.40	.35	.47
15. Relay pipe (all sizes)	146 l. f.	1 00	1.50	1.20
16. Reinf. conc. pipe culverts 18"	180 l. f.	2.40	2 50	3 00
17. Reinf. conc. pipe culverts 24"	776 l. f.	3.20	3 45	4 20
18. Reinf. conc. pipe culverts 27"	62 l. f.	4.00	4 00	5.40
19. Reinf. conc. pipe culverts 30"	236 l. f.	4.50	5 00	6.47
20. Reinf. conc. pipe culverts 36"	206 l. f.	5.00	7 00	8 80
21. Reinf. conc. pipe culverts 42"	92 l. f.	7.70	8 25	12 40
22. Reinf. conc. pipe culverts 48"	80 l. f.	9 80	9 75	13 40
23. Reinf. conc. pipe culverts 60"	164 l. f.	16 90	13 25	20.20
24. Reinf. conc. pipe culverts 72"	312 l. f.	26.20	19 00	27 00
25. Reinf. conc. flared end section, 18"	16	20.00	19 00	26.00
26. Reinf. conc. flared end section, 24"	28	25.00	23 00	35.00
27. Reinf. conc. flared end section, 27"	1	30.00	29 00	43 00
28. Reinf. conc. flared end section, 30"	8	35 00	34 00	50 00
29. Reinf. conc. flared end sections, 36"	6	60 00	55 00	80 00
30. Reinf. conc. flared end sections, 42"	4	80 00	65 00	97.50
31. Reinf. conc. flared end sections, 48"	4	90 00	80 00	120 00
32. Clay pipe underdrains 6"	114 l. f.	2.00	1 00	1 10
33. Class 1 excavation	337 c. y.	5.00	1 50	5.20
34. Class A-1½" concrete	182.2 c. y.	45 00	40.00	44 .80
35. Reinforcing steel	19,698 lbs.	.10	.10	.12

HIGHWAY IMPROVEMENTS, WASHINGTON

OWNER: Washington Dept. of Highways, Olympia; Clarence Hickey, director.

PROJECT: Grading, clearing, grubbing and draining 2.081 miles of Primary State Highway No. 1, in Cowlitz County, from Chicken Coop Inn to Kalama, Wash. Work includes 296,220 cu. yd. of solid rock excavation. Also involves slope treatment, finishing 104.7 stations of the roadway, and erecting necessary structures.

CONDITIONS: Contractor to furnish all materials and complete work in 180 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.35 to $2.00 per hour; semi-skilled, $1.10 to $1.40; and common, $1.15 to $1.25.

BIDS: Twelve bids were received December 28, 1944, ranging from the contract low of $262,748 to $561,328.

LIST OF BIDDERS:

1. Strong & Macdonald, Inc., Tacoma, Wash. (contract) $262,748
2. N. Fiorito Co., Seattle, Wash. 277,018
3. Erickson Paving Co., Seattle, Wash. 297,902
4. Goetz & Brennan, Seattle, Wash. 309,558
5. Kuckenberg Constr. Co., Portland, Ore. 310,128
6. Northwest Constr. Co., Seattle, Wash. 319,015
7. Sound Constr. & Engr. Co., Seattle, Wash. 330,060
8. D. F. Whittaker, Seattle, Wash. 344,220
9. E. C. Hall Co., Portland, Ore. 360,939
10. K. L. Goulter & Co., Seattle, Wash. 390,226
11. Guerin Bros., South San Francisco, Calif. 522,469
12. L. Romano Engr. Co., Seattle, Wash. 561,328

Item	Quan	Unit Prices (1)	(2)	(3)
1. Clearing	33.42 ac.	$300 00	$300 00	$300.00
2. Grubbing	16.11 ac	300.00	300.00	300.00
3. Common excav. (incl. 600-ft. haul)	15,670 c. y.	.50	.73	.76
4. Solid rock excav. (incl. 600-ft. haul)	296,220 c. y.	.70	.73	.76
5. Common trench excav. (incl. 600-ft. haul)	2,400 c. y.	.50	.75	1.20
6. Overhaul on above items (stations)	241,825 c. y.	.01	.01	.02
7. Overhaul on above items (miles)	2,201.09 c. y.	4 00	5.00	6.00
8. Structure excavation	2,010 c. y.	2.00	1.50	3.50
9. Slope treatment	9,715 l. f.	.15	.10	.20
10. Finishing roadway (sta.-100-ft.)	104.7 sta.	15 00	15 00	15 00
11. Gravel backfill in place	360 c. y.	3.00	6 00	3 50
12. Cr. stone surf. base course	280 c. y.	5.00	5.00	3 00
13. Cr. stone surf. top course	210 c. y.	5 00	5 00	3 00
14. Class A concrete	78 c. y.	40 00	35.00	55.00
15. Steel reinforcing bars	16,870 lb.	.07	.06	.10
16. Rein. conc. rt.-of-way markers	28 ea.	5 00	3 00	5.00
17. 4-in. wrought iron water pipe	210 l. f.	2 00	1.50	1.75
18. 12-in. conc. or vitr. clay culv. pipe	120 l. f.	1 00	1.10	1.00
19. 18-in. std. rein. conc. culv. pipe	645 l. f.	3 00	2.20	2.50
20. 24-in. std. rein. conc. culv pipe	408 l. f.	4 00	5.50	3.50
21. 36-in. std. rein. conc. culv. pipe	144 l. f.	8.00	8.00	15.00

HIGHWAY RESURFACING, OHIO

OWNER: Ohio Dept. of Highways, Columbus.

PROJECT: Asphaltic concrete resurfacing 6.843 miles of Section Troy of State Highways No. 196 and 471, and Sections A-1, A-2 and A-3 of State Highway No. 245 in Miami County, Ohio. Involves all necessary roadway and borrow excavation; removal of existing pavement; sealing the existing pavement edges; asphalt concrete surfacing; side approaches, mail box turnouts and berm material; drainage structures; and appurtenant work.

CONDITIONS: Contractor to furnish all materials and complete work by Oct. 15, 1945. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.15 to $1.725 per hour; semi-skilled, 85c. to $1.575; and common, 37½c. to 75c. Bid totals include premium for industrial insurance and cost for maintaining traffic.

BIDS: Only one bid was received March 27, 1945, the contract low of $137,944 from Fenton Construction Co., Ashland, Ohio. Engineer's estimate was $138,310.

Part A

Item	Quan.	Unit Prices (1)	(2)*
1. Roadway excavation, unclassified	2 904 c. y.	$1.25	$1.00
2. Borrow (contractor to furnish)	5,000 c. y.	1.50	1.00
3. Borrow, using No. 7 screenings (Sect. M-2.7) or granulated slag (Sect. M-3.12)	340 c. y.	2.60	3.60
4. Remove and dispose of exist. pavmt.	200 s. y.	1.00	.60
5. Sealing (only) existing pavmt. edge	44,399 l. f.	.03	.025
6. Asphaltic concrete base course	1,083 c. y.	10.30	11.20
7. Asph. conc. leveling course	5,231 c. y.	10.30	10.80
8. Bitum. prime coat AE-3 Sect. M-5.12, including sand cover	7,302 gal.	.18	.15
9. Asphaltic conc. surf. course, Type A	3 041 c. y.	10.30	10.50
10. 1½-in. insulation course	13,000 s. y.	.14	.20
11. Side approaches, mail box turnouts and berm material	976 c. y.	2.50	2.70
12. Guard rail removed and rebuilt	874 l. f.	1.25	.80
13. Stone underdrain (French drain No. 2)	1,800 l. f.	.20	.30
14. Remove and dispose of tops from exist. 12x12-in. concrete posts	117 ea.	.50	1.00
15. Premium on industrial insurance	Lump Sum	2,000.00	600.42
16. Maintain traffic, incl. lights, signs, barricades and watchmen (24-hr. service)	Lump Sum	1,500.00	1,640.00

Part B

17. Roadway excavation, unclassified	15 c. y.	2.00	1.50
18. Remove and dispose of exist. bitum. concrete pavement	157 s. y.	.50	.50
19. Remove and dispose of exist. brick pavement	214 s. y.	.75	1.00
20. Remove and dispose of exist. brick wearing course	180 s. y.	.75	.60
21. Remove and dispose of exist. rock asphalt wearing course	3,065 s. y.	.25	.35
22. Remove and dispose of exist. concrete base	100 s. y.	1.50	.50
23. 1½-in. insulation course	461 s. y.	.40	.40
24. Asphaltic concrete leveling course	752 c. y.	10.70	10.20
25. Asphaltic concrete base course	64 c. y.	10.70	11.00
26. Bitum. prime coat AE-3 Sect. M-5.12, including sand cover	1,452 gal.	.18	.17
27. Asph. conc. surf. course, Type B	320 c. y.	10.70	10.50
28. Reset manhole castings to grade	26 ea.	20.00	30.00
29. Reset water valve boxes to grade	8 ea.	15.00	8.00
30. 12x18-in. concrete header	100 l. f.	1.50	1.50
31. Premium on industrial insurance	Lump Sum	300.00	107.61
32. Maintain traffic, incl. lights, signs, barricades and watchmen (24-hr. serv.)	Lump Sum	300.00	350.00

* *Engineer's estimate.*

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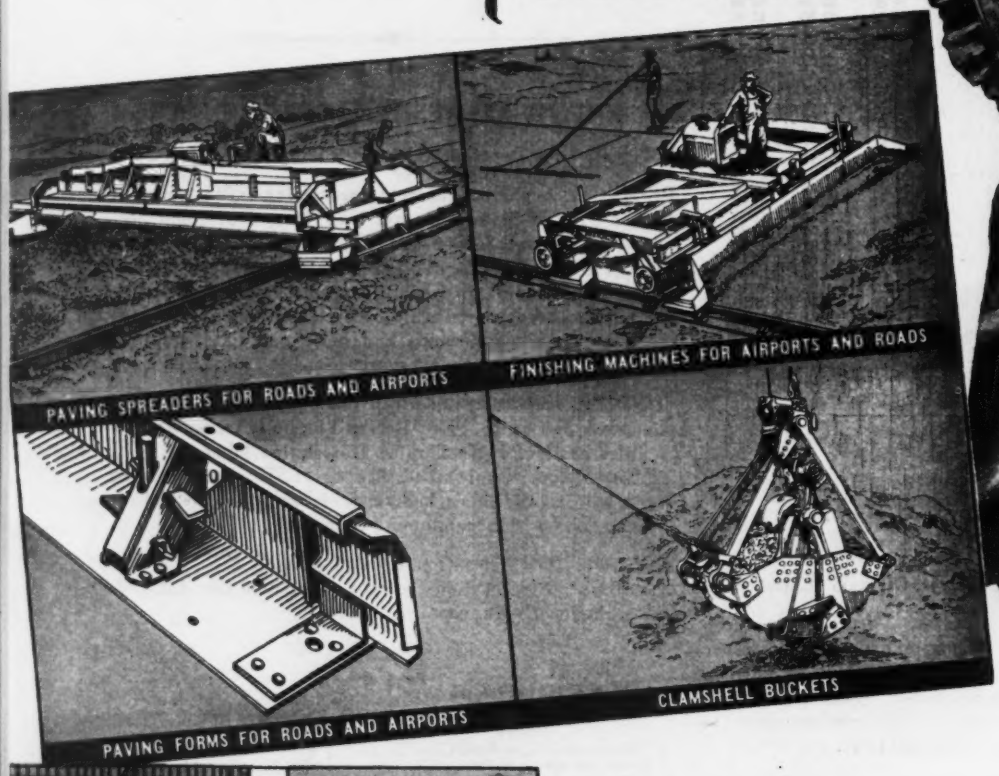
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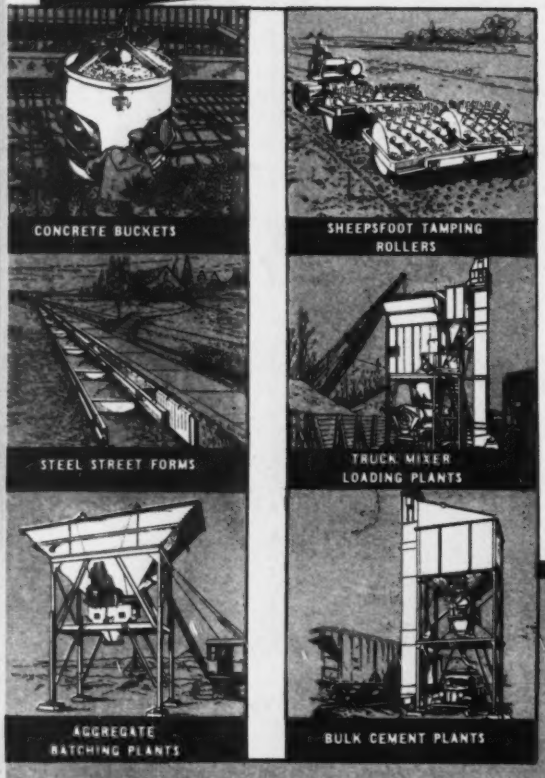
PAVING FORMS FOR ROADS AND AIRPORTS
CLAMSHELL BUCKETS



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BLAW-KNOX DIVISION of Blaw-Knox Co.
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BLAW-KNOX
CONSTRUCTION EQUIPMENT

IMPROVEMENT OF HIGHWAYS HUNTERDON COUNTY, NEW JERSEY

OWNER: New Jersey State Highway Department. C. F. Bedwell, construction engineer.

PROJECT: Reinforced concrete paving of half of divided highway for 2.768 miles, from VanSykles Corner to White House, Hunterdon County, New Jersey. Including 43,673 cu. yds. of earth roadway excavation; 49,129 sq. yds. 10 in. reinforced concrete paving surface and 65,985 lbs. reinforcing steel in structures. All materials to be furnished by contractor and work to be completed in 125 calendar days. Rail and highway transportation facilities available.

BIDS: Six bids were received on October 10. 1945, ranging from the contract low of $528,743 to $605,540.

LIST OF BIDDERS

Franklin Contracting Co., Newark, N. J. (contract)	$528,743
Woodcrest Constr. Co., N. Y. C.	547,768
Weldon Constr. Co., Westfield, N. J.	578,489
R. W. Cleveland Co., E. Orange, N. J.	581,798
F. A. Canuso, Philadelphia, Pa.	601,831
S. J. Groves & Sons, Woodbridge, N. J.	605,540

Item	Quantity	Unit Prices (1)	(2)
1. Roadway Excavation-Earth	43,673 cu. yds.	$0.50	$1.30
2. Pavement Excavation	6,197 sq. yds.	0.50	1.50
3. Ditch Excavation	250 cu. yds.	2.00	2.00
4. Channel Excavation	500 cu. yds.	2.50	2.00
5. Subbase	19,500 cu. yds.	1.40	2.00
6. Subgrade	49,422 sq. yds.	0.20	0.20
7. 2" Resurface Stone Shoulder	15,518 sq. yds.	0.30	0.60
8. 7" Stone Shoulder	4,356 sq. yds.	0.80	0.82
9. 8" Stone Shoulder	27,700 sq. yds.	0.90	1.00
10. Porous Fill	500 cu. yds.	2.00	2.45
11. 4" Topsoiling	48,500 sq. yds.	0.45	0.30
12. 6" Topsoiling	550 sq. yds.	0.60	0.35
13. Sodding	1,100 sq. yds.	1.25	0.85
14. Conc. Bag Slope Protection	700 cu. yds.	20.00	15.00
15. 4" Macadam Base Course	6,600 sq. yds.	0.90	0.15
16. 2" Mod. Pen. Mac. Inter. Course	6,600 sq. yds.	0.70	0.80
17. 1" Pavement, Type A or T	11,250 sq. yds.	0.65	1.00
18. 2" Pavement, Type A or T	4,500 sq. yds.	1.20	1.50
19. 10" Rein. Conc. Pavement Surf	49,129 sq. yds.	4.80	4.50
20. 18" Bridge Approach Slabs	133 sq. yds.	9.00	7.46
21. Underdrain, Type F	2,300 lin. ft.	1.90	0.90
22. 18" Rein. Conc. Culvert Pipe	1,867 lin. ft.	3.75	3.50
23. 24" Rein. Conc. Culvert Pipe	150 lin. ft.	6.50	5.00
24. 6" Bit. Coat. Corrug. Metal Pipe	120 lin. ft.	2.50	1.60
25. 12" Corrug. Metal Pipe	82 lin. ft.	4.00	2.75
26. 18" Corrug. Metal Pipe	50 lin. ft.	5.75	8.00
27. Manholes	2	150.00	200.00
28. Inlets, Type B and D	24	150.00	200.00
29. Inlets & Manholes, Exist. Castings	3	125.00	150.00
30. Reset Inlet Heads	36	25.00	20.00
31. Reset Manhole Heads	1	25.00	20.00
32. 10" Concrete Gutter	450 sq. yds.	5.65	3.30
33. Grouted Rubble Stone Gutter	130 sq. yds.	3.90	3.50
34. White Conc. Vert. Curb	3,000 lin. ft.	1.65	1.32
35. White Conc. Sloping Curb	5,500 lin. ft.	1.70	1.41
36. Headwalls	40 cu. yds.	45.00	40.00
37. Culvert	8 cu. yds.	50.00	40.00
38. Class "C" Conc. in Steps	10 cu. yds.	45.00	50.00
39. Class "B" Conc. in Pav. Footings	15 cu. yds.	20.00	15.00
40. Monuments	25	25.00	15.00
41. Wire Rope Fence	3,900 lin. ft.	1.65	1.30
42. Guard Fence Anchorages	19	90.00	70.00
43. Reset Wire Rope Fence	1,350 lin. ft.	0.90	0.70
44. Single Guard Rail Posts	20	4.60	4.00
45. Cleaning Exist. Drainage Struc.	Lump Sum	1000.00	750.00
46. Relaid 36" Plain Conc. Pipe	30 lin. ft.	4.00	10.00
47. Field Office	Lump Sum	1500.00	2000.00
48. Broken Stone or Gravel	250 cu. yds.	4.00	3.60
49. Relaid 24" V. C. Pipe	20 lin. ft.	4.00	10.00
50. 14" Rein. Conc. Pavement Sur	160 sq. yds.	7.00	4.85
51. Pulverising & Processing Soil	3,936 sq. yds.	1.00	1.75
52. Portland Cement for Soil	2,125 bags	0.75	0.75
53. Bit. Treatment for Soil	2,362 gals.	0.15	0.17
54. Cover Material for Soil	69 tons	3.00	2.00
55. Channel Excavation	1,930 cu. yds.	3.00	2.00
56. Foundation Excavation	1,033 cu. yds.	7.00	8.00
57. Class B Conc. in Structure	344 cu. yds.	45.00	50.00
58. Class C Conc. in Structures	1,042 cu. yds.	27.00	37.00
59. Class D Conc. in Structures	145 cu. yds.	26.50	25.00
60. Concrete Balustrade	138 lin. ft.	8.00	7.00
61. Rein. Steel in Structures	65,985 lbs.	0.10	0.09
62. Structural Steel	55,550 lbs.	0.55	0.07
63. Waterproofing	100 sq. ft.	1.00	1.00
64. Clearing Site, Br. Sta. 374/21.0	Lump Sum	350.00	800.00
65. Clearing Site, Br. Sta. 392/40.0	Lump Sum	350.00	800.00
66. Clearing Site, Br. Sta. 408/15.0	Lump Sum	350.00	800.00
67. Field Office	Lump Sum	850.00	1279.92

HIGHWAY IMPROVEMENTS, WASHINGTON

OWNER: Washington Dept. of Highways, Olympia, Wash. Clarence Hickey, director.

PROJECT: Grading, drainage structures, clearing and grubbing 3.445 miles of Primary State Highway No. 1 from Martins Bluff to Chicken Coop Inn, Cowlitz County, Wash.

CONDITIONS: Contractor to furnish all materials except 12- and 18-in. concrete or vitrified clay culvert pipe (standard), and complete work in 210 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor $1.50 to $1.75 per hour; semi-skilled, $1.15 to $1.60; and common, $1.00 to $1.25.

BIDS: Fourteen bids were received December 28, 1944, ranging from the contract low of $442,592 to $722,015.

LIST OF BIDDERS:

1. Erickson Paving Co., Seattle, Wash. (contract)	$442,592
2. R. A. Heintz, Portland, Ore.	464,921
3. Goetz & Brennan, Seattle, Wash.	518,107
4. Strong & Macdonald, Inc., Tacoma, Wash.	519,006
5. Northwest Construction Co., Seattle, Wash.	526,015
6. N. Fiorito Co., Seattle, Wash.	531,545
7. Sound Constr. & Engr. Co., Seattle, Wash.	541,792
8. Kuckenberg Constr. Co., Portland, Ore.	567,301
9. L. Romano Engr. Co., Seattle, Wash.	630,273
10. E. C. Hall Co., Portland, Ore.	630,409

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	58.1 ac.	$300.00	$400.00	$250.00
2. Grubbing	31.5 ac.	300.00	330.00	220.00
3. Common excav. (incl. 600-ft. haul)	225,150 c. y.	.48	.18	.31
4. Solid rock excav. (incl. 600-ft. haul)	270,520 c. y.	.48	.73	.92
5. Unclass. excav. (incl. 600-ft. haul)	14,590 c. y.	.48	.20	.92
6. Common trench excav. (incl. 600-ft. haul)	6,420 c. y.	1.20	1.00	1.60
7. Solid rock trench excav. (incl. 600-ft. haul)	980 c. y.	3.00	1.00	1.82
8. Overhaul on above materials	250,360 sta. c. y.	.01	.02	.01
9. Overhaul on above materials	4,267.63 mi. c. y.	4.00	5.00	4.00
10. Slope treatment	17,467 l. f.	.20	.10	.10
11. Finishing roadway (sta., 100-ft.)	197.8 sta.	15.00	10.00	15.00
12. Structure excavation	3,540 c. y.	2.50	2.00	2.00
13. Excav. for sand drains (incl. haul)	6,500 l. f.	1.80	2.00	1.60
14. Gravel backfill, in place	395 c. y.	3.50	4.00	3.00
15. Backfill for sand drains	760 c. y.	3.00	2.50	3.00
16. Selected roadway borrow	22,390 c. y.	1.75	2.25	1.75
17. Selected sand borrow	7,610 c. y.	1.75	2.25	2.25
18. Cr. stone surf. top crse. on rdway	1,330 c. y.	3.00	4.00	2.25
19. Cr. stone surf. base crse. on rdway	2,220 c. y.	3.00	4.00	2.25
20. Sand filler, incl. haul	360 c. y.	2.00	2.25	2.00
21. Water	98 M gal.	2.50	3.00	4.00
22. Class A concrete	641 c. y.	40.00	42.50	38.00
23. Steel reinforcing bars	110,230 lb.	.08	.06	.055
24. Rein. conc. rt.-of-way markers	110 ea.	5.00	4.00	4.00
25. Rein. conc. F. A. markers	3 ea.	16.00	25.00	15.00
26. Remove existing concrete pavement	1,403 s. y.	.50	.50	.30
27. Remove existing guard rail	200 l. f.	.30	1.00	.10
28. Place conc. or vitr. clay pipe, 12-in.	780 l. f.	1.00	1.25	1.10
29. As above, 18-in.	51 l. f.	2.00	2.00	2.00
30. Std. rein. conc. culv. pipe, 12-in.	75 l. f.	2.00	1.75	1.30
31. As above, 18-in.	882 l. f.	2.50	3.25	2.50
32. As above, 24-in.	351 l. f.	3.35	4.00	3.20
33. As above, 36-in.	452 l. f.	7.50	8.00	8.25
34. 36-in. ext. str. rein. conc. culv. pipe	240 l. f.	9.00	9.00	10.00

REPAIRING SEAWALL AND HIGHWAY MASSACHUSETTS

OWNER: Massachusetts Dept. of Public Works, Boston.

PROJECT: Rebuilding concrete seawall and resurfacing sections of Sea View Avenue in Oak Bluffs, Mass., with bituminous concrete pavement. Involves raising and restoring approximately 728 feet of sea wall, and reconstructing granolithic sidewalks and bituminous concrete highway damaged by hurricane.

CONDITIONS: Contractor to furnish all materials and complete work by June 23, 1945. Highway transportation facili-

(*Continued on following page*)

REPAIRING SEAWALL, MASSACHUSETTS

(*Continued from preceding page*)

ties available. Wage rates are: skilled labor, $1.25 to $1.75 per hour; semi-skilled, 85c. to $1.50; and common, 90c.

BIDS: Six bids were received February 27, 1945, ranging from the contract low of $94,401 to $234,409. Contract awarded April 25, 1945.

PARTIAL LIST OF BIDDERS:

1. Berke-Moore Co., Inc., Brookline, Mass. (contract) . $94,401
2. M. F. Roach Co., E. Bridgewater, Mass. 97,264
3. Thomas Brothers, Boston, Mass. 97,399

Item	Quan	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	600 c. y.	$2.50	$2.00	$1.00
2. Ordinary borrow	320 c. y.	1.00	1.00	1.50
3. Sand borrow for cover	30 c. y.	3.00	3.00	2.00
4. Loam or clay hardening	250 c. y.	2.65	2.00	2.00
5. Fine grading, rolling and finishing	2,200 s. y.	.05	.08	.10
6. Bitum. mat'l. for surf. treatment	1,000 gal.	.25	.35	.40
7. Class F. bitum. conc. pavement	530 ton	12.00	9.00	12.00
8. Timber piles	2,600 l. f.	1.50	2.50	1.50
9. Class C cem. conc. masonry	355 c. y.	30.00	30.00	30.00
10. Field stone masonry in cem. mortar	12 c. y.	20.00	25.00	25.00
11. Riprap removed and relaid	360 c. y.	5.00	8.00	8.00
12. 12-in. vitr. clay or conc. pipe	8 l. f.	1.00*	2.50*	1.00†
13. Unclassified excavation	1,700 c. y.	2.50	2.00	3.00
14. Ordinary borrow	3,400 c. y.	1.00	1.00	1.25
15. Sand borrow	200 c. y.	2.00	3.00	2.00
16. Sand borrow for cover	35 c. y.	3.00	3.00	2.00
17. Loam or clay hardening	450 c. y.	2.65	2.00	2.00
18. Fine grading, rolling and finishing	10,100 s. y.	.05	.08	.10
19. Bitum. mat'l. for surf. treatment	1,250 gal.	.25	.35	.40
20. Cl. F. bituminous conc. pavement	520 ton	12.00	9.00	12.00
21. Cl. B cem. concrete masonry	1,100 c. y.	30.00	30.00	30.00
22. Steel reinforcement for structures	19,100 lb.	.08	.10	.10
23. Riprap	190 c. y.	10.00	10.00	10.00
24. Riprap removed and relaid	50 c. y.	5.00	8.00	8.00
25. Catch basins	6 ea.	100.00	100.00	100.00
26. 12-in. rein. concrete pipe	170 l. f.	2.00	2.50	2.50
27. 6-in. light weight cast iron pipe	34 l. f.	1.50	5.00	1.50
28. Highway guard, Type (4 in. x 10 in.) W1W	120 l. f.	1.50	2.00	2.00
29. Chain link fence, remove and reset	240 l. f.	1.25	1.50	2.00
30. Two-rail iron fence, remove and reset	550 l. f.	1.25	2.00	1.00
31. Three-rail iron fence, remove and reset	700 l. f.	2.00	2.00	1.50
32. Concrete curb, Type VA	1,830 l. f.	1.50	2.25	2.00
33. Concrete curb inlets	3 ea.	25.00	50.00	30.00
34. Cl. F. bit. conc. walk surface	250 ton	12.00	12.00	12.00
35. Concrete sidewalk	800 s. y.	3.00	3.25	2.50
36. Lamp posts, remove and reset	3 ea.	25.00	100.00	30.00
37. Conc. fountain, remove and reset	Lump Sum	25.00	100.00	25.00
38. Wooden steps, remove and rebuild	Lump Sum	50.00	100.00	40.00
39. Concrete steps, remove and rebuild	Lump Sum	100.00	100.00	20.00
40. Remove hurricane debris	Lump Sum	250.00	300.00	100.00
41. Loam borrow	950 c. y.	3.00	2.50	2.50
42. Seeding	5,800 s. y.	.12	.10	.10

*Cement concrete pipe. † Vitrified clay pipe.

HIGHWAY, FLORIDA

OWNER: State Road Dept. of Florida, Tallahassee.

PROJECT: Construction of bituminous surfaced highway with shell base course 6.795 miles long from a point approximately 0.5 miles north of Clay County Line and Cedar Creek and between Cedar Creek and Hamilton Street along St. John's Avenue, Jersey Street and Park Street, southwest of Jacksonville, in Duval County, Fla. Includes necessary clearing and grubbing, excavation, drainage structures, curbs, walks and gutters, mixing and compacting roadway material, shell base course, bituminous surfacing, etc. Alternate was allowed for Ocala rock base or shell base course. Contract awarded on latter basis.

CONDITIONS: Contractor to furnish all material and complete work in 170 working days. Rail, highway and water transportation facilities available. Prevailing wage rates to be paid on project.

BIDS: Five bids were received December 19, 1944, ranging from the contract low of $375,511 to $421,257 on the shell base alternate, and from $390,659 to $456,213 on the Ocala rock base alternate.

LIST OF BIDDERS: (Shell base alternate)

1. Duval Engr. & Contracting Co., Jacksonville, Fla. (contract) $375,511
2. Brinson Construction Co., Tampa, Fla. 386,418
3. L. J. & W. L. Cobb, Inc., Tampa, Fla. 409,966
4. J. D. Manly Constr. Co., Leesburg, Fla. 420,108
5. Cone Bros. Contracting Co., Tampa, Fla. 421,257

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	72.07 ac.	$128.00	$200.00	$200.00
2. Regular excavation	85,122 c. y.	.56	.50	.51
3. Lateral ditch excavation	3,762 c. y.	.74	.75	.45
4. Sub-soil excavation	7,064 c. y.	1.28	.60	.75
5. Remove exist. pavement (conc. curb, retaining walls, side walks, drives, and penetr. surf.)	9,890 s. y.	.20	.40	.50
6. Overhaul (½-mi. cu. yd.)	7,148 c. y.	.07	.10	.08
7. Mixing and compacting, roadway (6-in. deep)	36,201 s. y.	.05	.08	.10
8. Mixing and compacting, roadway (12-in. deep)	45,106 s. y.	.07	.12	.15
9. Stabilizing material	2,138 c. y.	2.96	4.00	4.50
10. Mixing and compacting material, commercial (12-in. deep)	25,655 s. y.	.07	.12	.13
11. Ocala rock base (single course, 6-in. thick) (alternate)	116,520 s. y.	1.03	1.20	1.20
12. Tar prime mat'l, RT-2, RT-3 or RT-4	26,217 gal.	.19	.20	.20
13. Paint material (RC-3)	13,982 gal.	.15	.15	.15
14. Concrete, Class A, culverts	495.31 c. y.	65.00	50.00	55.00
15. Concrete, Class A, headwalls	110.72 c. y.	50.00	55.00	55.00
16. Reinforcing steel	53,192 lb.	.065	.07	.08
17. Conc. pipe culv. (15-in. cross drain)	1,170 l. f.	2.75	2.00	2.25
18. Conc. pipe culv. (18-in. cr. drain)	3,349 l. f.	3.00	3.00	2.75
19. Conc. pipe culv. (21-in. cr. drain)	49 l. f.	4.00	4.00	3.50
20. Conc. pipe culv. (24-in. cr. drain)	2,123 l. f.	4.25	4.00	3.75
21. Conc. pipe culv. (30-in. cr. drain)	611 l. f.	6.00	6.00	5.00
22. Conc. pipe culv. (36-in. cr. drain)	647 l. f.	9.00	7.00	7.50
23. Conc. pipe culv. (42-in. cross drain)	99 l. f.	11.50	12.00	9.00
24. Conc. pipe culv. (18-in. side drain)	1,116 l. f.	2.75	3.00	2.75
25. Relay exist. cross drain pipe (21-in. conc.)	26 l. f.	1.50	4.00	2.00
26. As above, 24-in. conc. pipe	45 l. f.	1.50	5.00	2.00
27. As above, 30-in. conc. pipe	133 l. f.	2.00	5.00	2.50
28. Relay exist. side drain pipe, 18-in. conc.	153 l. f.	1.25	2.00	1.50
29. As above, 24-in. conc. pipe	82 l. f.	1.50	2.00	2.00
30. Underdrain (6-in. pipe)	8,636 l. f.	1.50	1.50	1.50
31. Inlets, Type C, 0-4-ft. deep	6 ea.	125.00	200.00	120.00
32. Inlets, Type E, 0-4-ft. deep	1 ea.	135.00	200.00	120.00
33. Inlets, Type E, 6-8-ft. deep	1 ea.	150.00	250.00	150.00
34. Inlets, Type BS, 4-6-ft. deep	7 ea.	140.00	250.00	130.00
35. Inlets, Type BV, 4-6-ft. deep	1 ea.	150.00	250.00	130.00
36. Inlets, Type BR, 4-6-ft. deep	10 ea.	140.00	250.00	130.00
37. Inlets, Type BM-1, 4-6-ft. deep	9 ea.	140.00	250.00	175.00
38. Inlets, Type BM-1, 6-8-ft. deep	3 ea.	165.00	300.00	200.00
39. Inlets, Type B-V-M-1 (4-6-ft. deep)	2 ea.	150.00	250.00	200.00
40. Inlets, Type BMR (4-6 ft. deep)	11 ea.	145.00	250.00	175.00
41. Inlets, Type BMR (6-8-ft. deep)	3 ea.	160.00	300.00	190.00
42. Manhole, Type A, 10-12-ft. deep	1 ea.	250.00	400.00	190.00
43. Manholes, Type B, (4-6-ft. deep)	6 ea.	200.00	250.00	120.00
44. Manhole, special, 4-6-ft. deep	1 ea.	250.00	400.00	150.00
45. Conc. curb and gutter	14,835 l. f.	1.25	1.20	1.30
46. Conc. valley gutter	67 l.f.	1.50	2.00	1.30
47. Concrete sidewalk, 4-in. thick	16,950 s. f.	.28	.25	.25
48. Concrete sidewalk, 6-in. thick	3,094 s. f.	.35	.40	.30
49. Right-of-way markers	41 ea.	8.00	4.00	5.00
50. Sprigging	205,500 s. y.	.035	.03	.03
51. Guard rail posts (conc.)	107 ea.	5.00	5.00	6.00
52. Concrete ditch pavmt. (4-in. thick)	545 s. y.	2.25	4.00	2.75
53. Relay exist. 4-in. water main	743 l. f.	2.10	1.00	2.50
54. Shell base (single course, 6-in. thick) (Alternate)	116,520 s. y.	.90	1.00	1.15
55. Reset existing curb	200 l. f.	.60	1.00	1.00
56. Aggregate for wearing course	4,315 c. y.	6.75	6.00	6.75
57. Aggregate for mineral seal	648 c. y.	5.90	7.00	6.75
58. Retread bitum. material, plant mix	104,868 gal.	.10	.11	.13

HIGHWAY AND BRIDGES, VIRGINIA

OWNER: Virginia Department of Highways, Richmond.

PROJECT: Construction of 6.089 miles of highway and three bridges in Albemarle County, from a point 1.597 miles east of Nelson and the Albemarle County Line to 11.337 miles west of the West county line of Charlottesville, Route No. 250. Va. Alternates were asked on the paving, either 10"-9"-10" waterbound macadam, or 8-in. reinforced cement concrete pavement. Award made on basis of waterbound macadam. Bridges included are: one-span steel beam bridge over Stockton Creek at Sta. 331+35, span length 65¼-ft., 22-ft. clear roadway; one three-span reinforced concrete beam, each span 35-ft., Sta. 207+50, overall length 112½-ft., 28-ft. clear roadway; and one three-span reinforced concrete beam, each span 40-ft., Sta. 239+75, overall length 127½-ft., 28-ft. clear roadway.

(*Continued on following page*)

HIGHWAY AND BRIDGES, VIRGINIA

(*Continued from preceding page*)

CONDITIONS: Contractor to furnish all materials and complete work in 210 calendar days from date of award. Rail and highway transportation facilities available. Wage rates are those prevailing in the area.

BIDS: Seven bids were received March 8, 1945 on the waterbound macadam basis, ranging from the contract low of $519,517 to $616,028. On the concrete pavement basis the bids ranged from $592,280 to $711,101, six bids having been received.

LIST OF BIDDERS: (Waterbound macadam pavement)

1. The Lane Constr. Corp., Meriden, Conn. (contract) $519,517
2. W. N. Jackson, Roanoke, Va., and W. E. Graham & Sons, Cleveland, N. C. 522,419
3. Ralph E. Mills Co., Inc., Roanoke, Va. 530,881
4. Perkins-Barnes Constr. Co., Inc., Blackstone, Va. 533,046
5. Mecklenburg Constr. Co., Durham, N. C. 574,907
6. Pendleton Constr. Corp., Wytheville, Va., and Albert Bros., Contractors, Inc., Salem, Va. 583,738
7. Bero Engr. & Constr. Corp., Langley Field, Va. 616,028

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	9 ac.	$375.00	$300.00	$350.00
2. Regular excavation	333,622 c. y.	.50	.48	.51
3. Concrete, Class A	991 c. y.	32.00	33.00	28.00
4. Concrete, Class B	44 c. y.	24.00	38.00	28.00
5. Metal reinforcement	84,330 lb.	.07	.06	.06
6. Conc. rt.-of-way monuments	146 ea.	10.00	2.00	2.00
7. 6-in. pipe underdrains	520 l. f.	1.25	.75	1.50
8. Subgrade underdrains, CD-1 or CD-2	2,290 l. f.	.50	.75	.75
9. 15-in. concrete pipe	669 l. f.	1.75	1.90	2.00
10. 18-in. pipe	1,302 l. f.	2.00	2.25	2.50
11. 24-in. pipe	435 l. f.	3.25	3.25	3.50
12. 30-in. pipe	102 l. f.	4.75	6.00	6.00
13. 36-in. pipe	156 l. f.	7.00	10.00	10.00
14. 60-in. pipe	75 l. f.	18.00	20.00	16.00
15. 12-in. pipe	303 l. f.	1.60	1.70	1.80
16. 18-in. pipe (3,000-D)	204 l. f.	2.25	2.75	3.00
17. 24-in. pipe (3,000-D)	327 l. f.	3.45	4.00	4.00
18. 36-in. pipe (3,000-D)	240 l. f.	7.50	8.00	8.00
19. 18-in. pipe (vit. clay)	33 l. f.	2.50	2.50	3.00
20. Pipe (relaid)	110 l. f.	2.00	5.00	3.00
21. Concrete Class C	94 c. y.	30.00	30.00	30.00
22. State project markers	3 ea.	10.00	5.00	5.00
23. Class 1 dry riprap (18-in. deep)	820 s. y.	3.00	6.25	6.00
24. Paved ditch	4,019 s. y.	1.10	1.50	2.00
25. Dry rubble masonry wall	50 c. y.	2.25	14.00	20.00
26. Brick masonry (posts)	4 c. y.	25.00	45.00	35.00
27. Mortar rubble masonry (post and walls)	16 c. y.	20.00	24.00	25.00
28. Concrete posts reset	2 ea.	10.00	10.00	25.00
29. Subgrade treatment material	16,684 ton	1.95	2.00	2.10
30. Stone, No. 9	158 ton	3.50	4.50	4.50
31. 6-in. waterbound macadam	6,489 s. y.	1.10	1.24	1.50
32. Bitum. material, RC-1 or RC-2	5,407 gal.	.12	.12	.12
33. Covering material	195 ton	5.00	4.50	4.50
Bridge—Steel Beam Span				
34. Struct. steel (superstructure)	Lump Sum	2,250.00	2,620.00	2,000 00
35. Lumber (superstructure)	Lump Sum	2,300.00	2,137.50	1,800 00
36. Class B concrete (substr.)	340.4 c. y.	25.00	29.40	20.00
37. Reinforcing steel (substr.)	680 lb.	.07	.06	.06
38. Class A excavation (substr.)	98 c. y.	5 00	3.75	2.00
39. Class B excavation (substr.)	292 c. y.	6.00	3.75	4.00
39a. Remove old structure	Lump Sum	1,200.00	450.00	300.00
Bridge—Reinforced Concrete, Three 35-ft. Spans				
40. Class A concrete (superstr.)	170 c. y.	55.00	35.50	40.00
41. Reinforcing steel (superstr.)	44,000 lb.	.07	.06	.06
42. Class A concrete (substr.)	191.8 c. y.	38.75	38.00	40 00
43 Class B concrete (substr.)	142.8 c. y.	30.00	31.00	26.00
44. Reintorcing steel (substr.)	8,130 lb.	.07	.06	.06
45. Class A excavation (substr.)	266 c. y.	1.00	3.75	2.00
46. Class B excavation (substr.)	444 c. y.	3.00	3.75	4.00
Bridge—Reinforced Concrete, Three 40-ft. Spans				
47. Class A concrete (superstr.)	194.5 c. y.	55.00	32.90	40.00
48. Reinforcing steel (superstr.)	50,275 lb.	.07	.06	.06
49. Class A concrete (substr.)	141.4 c. y.	38.75	33.00	38.00
50. Reinforcing stee l(substr.)	10,900 lb.	.07	.06	.06
51. Mortar riprap	1,028 s. y.	8.00	12 00	9 00
52. Class A excavation (substr.)	59 c. y.	4.00	3 75	2.00
53. Class B excavation (substr.)	139 c. y.	8.00	3.75	6.00
Pavement—Regular Bid				
54. 10-9-10-in waterbound macadam	85,873 s. y.	1.57	1.67	1.70
55. Bituminous mat'l., RC-1 or RC-2	114,655 gal.	.12	.12	.12
56. Covering material	4.302 ton	5.00	4.50	4.50
Pavement—Alternate Bid				
57. 8-in. rein. cem. conc. pavmt.	85,813 s. y.	3.25	2.87	.....
58. Bituminous mat'l., RC-1 or RC-2	158 gal.	.12	.30	.....
59. Covering material	8 ton	5.00	7.00	.....

BRIDGE APPROACHES, BAY COUNTY, FLORIDA

OWNER: State Road Dept. of Florida, Tallahassee; J. H. Dowling, state highway engineer.

PROJECT: Bituminous paving north and south approaches to bridge across North Bay at Lynn Haven, Bay County, Florida. Project, located on State Road No. 52, is 1.335 miles in length. Includes necessary clearing and grubbing; excavation; hydraulic embankment (56,358 cu.yd.); muck blanket; sand bituminous road mix, 6-in. thick; bituminous material (sand bituminous road mix and cut-back asphalt); 106 sq. yd. of reinforced cement concrete pavement 9-in. thick; concrete for structures; pipe culverts; relaying existing side-drain pipes; treated timber and sheet piling; inlets and manholes; sidewalks; sprigging; removal of existing concrete pavement and sidewalks; and other appurtenant work required for completion of the project.

CONDITIONS: Contractor to furnish all materials and complete project in 180 working days. Highway and water transportation facilities at project site and rail facilities available to Panama City. Wage rates stipulated are those prevailing in the area.

BIDS: Three bids were received August 23, 1945, ranging from the contract low of $120,832 to $134,402.

LIST OF BIDDERS:

1. C. C. Moore Constr. Co., Inc., Panama City, Fla. (contract) $120,832
2. Peacock Contracting Co., Panama City, Fla. 133,929
3. Coggin & Deermont, Chipley, Fla. 134,402

Item	Quan	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	22.59 ac.	$200.00	$120.00	$100.00
2. Regular excavation	10,536 c. y.	.45	.45	50
3. Lateral ditch excavation	800 c. y.	.45	.80	.65
4. Subsoil excavation (A-8 mat'L)	19,256 c. y.	.54	.40	.80
5. Remove exist. pavmt. (conc. pavmt. and conc. sidewalk)	933 s. y.	1.00	.20	.25
6. Hydraulic embankment	56,358 c. y.	.54	.60	.40
7. Overhaul	24,056 sta. c. y.	.01	01	.01
8. Muck blanket	34,000 s. y.	.20	.15	.19
9. Sand bituminous road mix, 6-in.	21,632 s. y.	.26	.28	.24
10. Bituminous mat'l. (sand bitum. rd. mix, cut-back asphalt)	129,792 gal.	.10	.14	.13
11. Cem. conc. pavmt., rein., 9-in. thick	106 s. y.	7.00	6.00	6.00
12. Treated structural timber (walse 3x8-in.; and splice blks., 3x8-in.)	6.3 Mbm	250.00	250.00	200.00
13. Concrete, Cl. A., culters.	68.11 c. y.	40 00	4.500	42.00
14. Concrete, Cl. A., headwalls	5.30 c. y.	40.00	50.00	50.00
15. Reinforcing steel	5,666 lb.	.10	.07	.10
16. Conc. pipe culvert (15-in. cross drain)	117 l. f.	2.00	2.00	2.00
17. As above, 18-in. cross drain	78 l. f.	3.00	3.00	3.00
18. As above, 24-in. cross drain	71 l. f.	4.00	4.50	4.50
19. As above, 36-in. side drain	30 l. f.	6.00	5.50	7.00
20. Relay exist. side-drain pipe, 18-in. conc.	34 l. f.	3.00	1.50	3.00
21. As above, 24-in. conc.	24 l. f.	3.00	2.50	4.00
22. As above, 36-in. conc.	30 l. f.	4.00	3.00	4.50
23. 15-in. bitum. coated corr. metal pipe culvert	120 l. f.	3.00	2.40	3.75
24. Treated timber piling (bulkheads and anchors)	6,584 l. f.	1.70	2.50	3.10
25. Timber sheet piling (2x8-in. rough)	80.1 Mbm	175.00	250.00	250.00
26. Inlets, Type BR (4 to 6-ft. deep)	3 ea.	200.00	150.00	200.00
27. Inlets, Type BS (0 to 4-ft. deep)	4 ea.	200.00	150 00	150.00
28. Inlet, Type BMR (4 to 6-ft. deep)	1 ea.	300.00	175.00	225.00
29. Inlets, Type BV (0 to 4-ft. deep)	2 ea.	200.00	150.00	175.00
30. Manhole, Type A (6 to 8-ft. deep)	1 ea.	400.00	250.00	250.00
31. Concrete curb and gutter	3,709 l. f.	1.40	1.25	1.45
32. Concrete sidewalk, 4-in. thick	160 s. f.	.30	.35	.25
33. Concrete sidewalk, 42-in. thick	175 s. f.	.35	.40	.30
34. Sprigging	50,000 s. y.	.04	.05	.06
35. Hardware (tie bars, bolts, etc.)	9,240 lb.	.15	.18	.12

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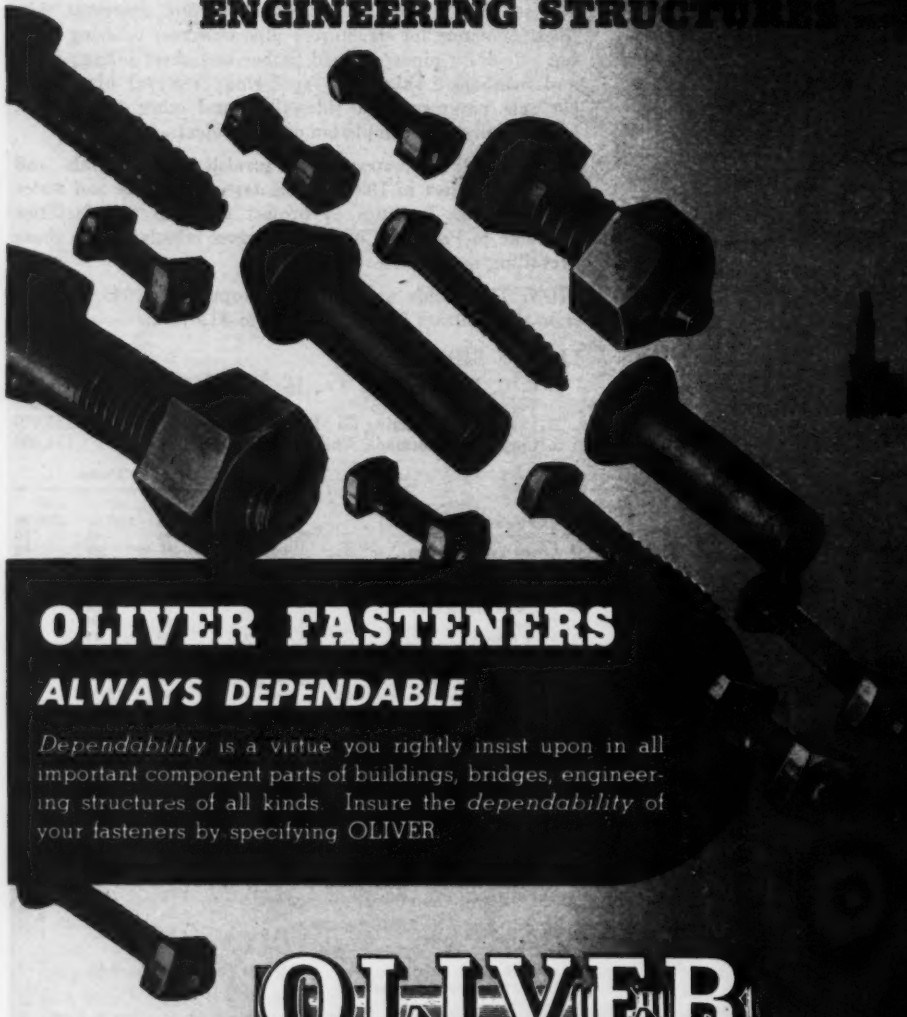

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HIGHWAY BRIDGE, VERMONT

OWNER: Vermont State Highway Dept., Montpelier.

PROJECT: Construction of steel I-beam bridge (length 69-ft. overall) with approaches surfaced with double tack coat of refined tar. Overall project length 0.383 miles. Work located on State Route No. 30, south of Newfane Village, crossing West River. Alternates were allowed for the use of dry rubble masonry or Class C concrete (Cyclopean concrete) for the structure. Contract awarded on basis of latter.

CONDITIONS: Rail and highway transportation facilities available to Newfane Village, and highway transportation to project site. Contractor to furnish all materials. Prevailing wage rates to be paid on project.

BIDS: Seven bids were received on the project, ranging from the contract low of $29,825 to $40,833. This range was for use of Class C concrete. On dry rubble masonry the range was from the low of $37,468 to $43,655.

LIST OF BIDDERS: Class C Concrete

1. Frank W. Whitcomb, Bellows Falls, Vt. (contract) $29,825
2. R. F. Carpenter, Alburg, Vt 36,340
3. Kelleher Corp., Turners Falls, Mass 37,946
4. W. W. Wyman, Inc., Shelburne Falls, Mass 39,807
5. M. J. Burrington, Jr., Bennington, Vt 40,023
6. The Henley-Lundgren Co., Worcester, Mass 40,166
7. T. J. Harvey & Sons, Inc., Adams, Mass 40,833

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Solid rock excavation	50 c. y.	$5.00	$2.00	$2.00
2. Common excav., incl. borrow	12,000 c. y.	.30	.43	.40
3. Trench excavation, earth	160 c. y.	2.00	1.00	1.50
4. Trench excavation, rock	10 c. y.	5.00	1.00	6.00
5. Channel excavation	880 c. y.	.50	1.40	1.15
6. Structure excavation	695 c. y.	2.00	3.00	6.00
7. Temporary bridge and maintenance of traffic	Lump Sum	1,000.00	1,200.00	2,500.00
8. Sub-base of gravel	3,000 c. y.	.60	.80	.40
9. Gravel shoulders	15 c. y.	2.00	2.00	2.00
10. Double tack coat of refined tar	3,300 gal.	.20	.20	.17
11. Concrete, Class A	110 c. y.	30.00	30.00	30.00
12. Reinforcing steel	14,070 lb.	.07	.07	.07
13. Steel superstructure (72,050 lb.)	Lump Sum	4,900.00	5,000.00	5,500.00
14. Conc. Class C (Cyclopean conc.)	513 c. y.	18.00	23.00	22.00
15. Dry rubble masonry (alternate for Item 14)	513 c. y.	40.00	25.20	25.00
16. 15-in. rein. concrete pipe	40 l. f.	2.00	2.00	2.00
17. 18-in. rein. concrete pipe	132 l. f.	2.50	2.50	2.75
18. Relaying pipe culverts	40 l. f.	1.00	.50	1.00
19. Riprap for bank protection (hvy. type, mod.)	150 c. y.	5.00	8.00	6.50
20. Cable guard rail	240 l. f.	1.00	1.00	1.25
21. Anchors for cable guard rail	5 ea.	15.00	12.00	22.00
22. Remove and reset cable guard rail	64 l. f.	.50	.80	.70
23. Guide posts	3 ea	3.00	2.00	4.00
24. Boundary markers	20 ea.	7.00	4.00	6.00

HIGHWAY BRIDGE, FLORIDA

OWNER: State Road Dept. of Florida, Tallahassee.

PROJECT: Removal of existing bridge structure over Massalina Bayou, Fourth Street in Panama City and constructing reinforced concrete bridge 496 ft. long, in Bay County, Fla.

CONDITIONS: Contractor to furnish all materials and complete work in 130 calendar days. Rail, highway and water transportation facilities available. Prevailing wage rates to be paid on project.

BIDS: Six bids were received December 19, 1944, ranging from the contract low of $90,042 to $124,777.

LIST OF BIDDERS:

1. Cleary Bros. Constr. Co., West Palm Beach, Fla. (contract) $90,042
2. C. C. Moore Constr. Co., Panama City, Fla. 93,006
3. Coggin & Deermont, Chipley, Fla. 94,913
4. The George D. Auchter Co., Jacksonville, Fla. 101,894
5. Hardaway Contracting Co., Columbus, Ga. 112,127
6. Hendry Corporation, Rattlesnake, Fla. 124,777

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Removal of existing structure	Lump Sum	$3,500.00	$3,000.00	$1,500.00
2. Concrete, Class AA, substruct.	156 c. y.	52.00	43.00	45.00
3. Concrete, Class AA, superstruct.	712 c. y.	43.00	43.00	45.00
4. Concrete handrail	983 l. f.	3.00	3.00	3.00
5. Reinforcing steel	189,790 lb.	.055	.06	.055
6. Precast conc. piling (18-in. sq.)	4,700 l. f.	7.00	7.50	7.25
7. Unloaded test piling (18-in. sq.)	45 l. f.	10.00	7.50	15.00
8. Waterproofing	2,728.1 s. y.	.75	1.00	1.00

BRIDGE SUBSTRUCTURE TENNESSEE AND ARKANSAS

OWNER: Dept of Highways and Public Works, Tennessee, and Arkansas State Highway Comm.; Modjeskie & Masters, Harrisburg, Pa., consulting engineers.

PROJECT: Main bridge substructure of highway bridge across the Mississippi River between Memphis, Tenn., and Crittenden County, Ark. (Part I). Involves construction of the Memphis abutment and the seven main piers of the bridge. Alternates were allowed on the placing of the mass volume of concrete in Piers 5, 6 and 7, either by pneumatic process, between the founding elevation and the bottoms of the distributing blocks, or by open dredge, tremie sealed method between the cutting edge elevation and the bottoms of the distributing blocks. Award was made on the latter basis. Length of structure 3,695 ft.

CONDITIONS: Contractor to furnish all materials and complete work in 760 days. Wage rates to be paid are those prevailing in the area. Rail, highway and water transportation facilities available to project site.

BIDS: Five bids were received July 18, 1945, ranging from the contract low of $4,333,174 to $7,438,930. Bid opening scheduled for February 28, 1945 was postponed.

LIST OF BIDDERS:

1. Merritt-Chapman & Scott Corp., New York, N. Y. (contract) $4,333,174
2. Kansas City Bridge Co. and Massman Constr. Co., Kansas City, Mo. 4,369,960
3. Dravo Corporation, Pittsburgh, Pa. 4,633,710
4. Four Companies, Inc., Boston, Mass. 5,393,642
5. Missouri Valley Bridge Co., Morrison-Knudsen Co., Winston Bros. Co., Leavenworth, Kan. 7,438,930

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Underwater fill, Pier 1	Lump Sum	$41,795.00	$18,000.00	$36,000.00
2. Willow mattress—Piers 1, 2 and 3	2,450 sq.	66.60	50.00	70.00
3. Stone for mattress	1,900 c. y.	8.20	10.00	12.00
4. Heavy riprap for mattress	18,000 c. y.	8.85	8.00	8.00
5. Riprap paving	400 sq.	72.00	44.00	40.00
6. Piles in place, Memphis abutment	5,640 l. f.	5.20	3.25	3.00
7. Concrete in footing, Memphis abutment	445 c. y.	28.80	20.00	30.00
8. Stone masonry facing, Memphis abutment	2,800 c. f.	6.25	6.30	10.00
9. Conc. behind facing, Memphis abutment	430 c. y.	52.00	31.50	36.00
10. Mass volume in Pier 1, between founding elev. and bottom of distributing block	4,970 c. y	45.00	54.50	65.00
11. Mass volume in Piers 2, 3 and 4, between founding elev. and bottoms of distributing blocks	25,200 c. y.	59.20	68.00	73.00
12. Mass volume in Piers 5, 6 and 7, pneumatic process, between founding elev. and bottoms of distributing blocks	21,700 c. y.	.....	34.00	37.00
13. (Alt. for Item 12) Mass volume in Piers 5, 6 and 7, open dredge, tremie sealed, between C. E. elev. and bottoms of distributing blocks.	23,800 c. y.	37.20	.....	32.00
14. Concrete in distributing blocks, Piers 1 to 7, incl.	3,300 c. y.	18.40	15.50	20.00
15. Stone facing, Piers 1 to 7, incl.	163,000 c. f.	4.80	4.90	4.70
16. Conc. behind facing, Piers 1 to 7, incl.	23,406 c. y.	13.60	15.00	15.00
17. Reinforcing steel, in place	371,000 lb.	.115	.08	.08
18. Structural metalwork and anchor bolts in place	251,000 lb.	.15	.15	.13

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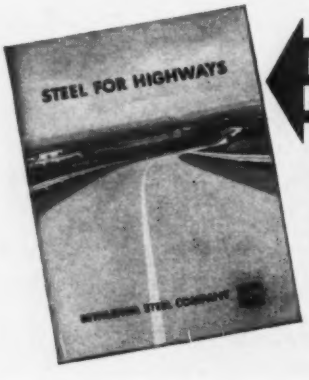

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BETHLEHEM STEEL

HIGHWAY AND BRIDGES, TEXAS

OWNER: Texas State Highway Dept., Austin, Tex. S. J. Treadway, Abilene, Tex., engineer.

PROJECT: Grading, structures, flexible base and double asphalt surface treatment of 12.051 miles of U.S. Highway 84 and 83 from U.S. Highway 83 to Coleman County Line. Taylor County, Tex. Includes necessary clearing and grubbing, excavation, blading embankment, stripping, rolling, overhaul, culverts, bridges, concrete piling, riprapping, sodding, roadway surfacing, and appurtenant work required for completion of project.

BIDS: Six bids were received December 12, 1944, ranging from the low of $488,072 to $623, 654.

LIST OF BIDDERS:

1. T. M. Brown & Son, Baird, Tex. (low bidder) $488,072
2. Austin Bridge Co., Dallas, Tex. 557,540
3. Thomas & Ratliff, Rogers, Tex. 575,171
4. Brazos Valley Constr. Co., Mineral Wells, Tex. 589,477
5. Holland Page, Austin, Tex. 613,284
6. Ernest Loyd, Fort Worth, Tex. 623,654

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	72.95 ac.	$40.00	$100.00	$70.00
2. Unclassified roadway excav.	179,020 c. y.	.35	.45	.44
3. Common borrow	8,084 c. y.	.20	.45	.44
4. Unclass. channel excavation	96,244 c. y.	.23	.45	.35
5. Unclass. structural excav. (culv.)	1,001 c. y.	2.50	4.00	3.50
6. Unclass. struct. excav. (bridges)	924 c. y.	2.50	5.00	7.50
7. Blading embankment	1,325 hr.	3.50	6.00	5.00
8. Stripping	6,800 c. y.	.50	.25	.35
9. Overhaul (yd. quarter-mile)	99,222 yd.	.10	.08	.07
10. Sprinkling	18,910 M gal.	1.50	.75	2.00
11. Rolling	2,450 hr.	3.50	3.75	4.00
12. Rolling	1,295 hr.	3.50	5.00	6.00
13. Flexible base	122,317 c. y.	.70	.85	.75
14. Additional ½-mile haul	2,503,030 c. y.	.03	.025	.0275
15. Prime coat (MC-1)	73,845 gal.	.11	.14	.10
16. Asphalt (100-150 pen.)	104,200 gal.	.11	.13	.10
17. Aggregate	3,620 c. y.	5.00	4.50	4.75
18. Cold mix blended rock asphalt pavement (Type B)	23 ton	10.00	10.00	7.50
19. Class A concrete, culvert	831.06 c. y.	23.50	31.00	35.00
20. Class A conc. for ext. str.	364.55 c. y.	30.00	31.00	35.00
21. Class A conc. (bents)	349.05 c. y.	23.50	31.00	35.00
22. Class A conc. (spans)	609.40 c. y.	23.50	31.00	35.00
23. Reinforcing steel	331,768 lb.	.055	.0625	.07
24. Structural steel	393,940 lb.	.07	.075	.0725
25. Removing old structures	21 ea.	100.00	90.00	190.00
26. 16-in. sq. cast-in-place conc. piling	120 l. f.	5.50	6.00	8.00
27. 16-in. sq. precast conc. test piling	140 l. f.	5.50	11.00	8.00
28. 16-in. sq. precast conc. piling	1,395 l. f.	5.50	5.75	8.00
29. Railing (Type 1)	1,440 l. f.	4.00	3.85	4.00
30. Railing (Type 2)	208 l. f.	4.00	2.50	4.00
31. Dry riprap (Type A)	439 c. y.	5.50	8.00	8.00
32. Grouted riprap	42 c. y.	7.00	16.00	10.00
33. Common mortar riprap	130 c. y.	12.50	17.00	15.00
34. Grates	1 ea.	15.00	25.00	10.00
35. Spot sodding	6,438 s. y.	.04	.06	.25
36. Concrete curb and gutter	6,292 l. f.	1.50	1.50	2.00
37. Right-of-way markers	168 ea.	2.50	2.50	3.00
38. Remove and replace rt.-of-way markers	8 ea.	1.50	2.00	2.00
39. Remove and replace timber post guard fence	140 ea.	1.50	2.00	2.00
40. Place timber post guard fence	11 ea.	1.50	1.25	1.00
41. Obliterate abandoned road	159 sta.	3.00	20.00	5.00
42. Remove old conc. (driveways and pavmt.)	1,522 s. y.	.50	.80	.25

HIGHWAY AND BRIDGES, TEXAS

OWNER: Texas State Highway Dept., Austin; W. H. Koether, Yoakum, Tex., engr.

PROJECT: Grading, drainage structures, flexible base and asphalt surface treatment of 3.057 miles of U. S. Highway No. 87 in DeWitt County, Tex. Includes construction of overpass spanning Texas & New Orleans Railroad, and erection of a bridge over Price's Creek.

CONDITIONS: Contractor to furnish all materials. Rail and highway transportation facilities available. Wage rates are to be those prevailing in area.

BIDS: Three bids were received August 21, 1945 ranging from the low of $241.150 to $317,111.

LIST OF BIDDERS:

1. D. R. Cloud, San Antonio, Tex. (low bidder) $241,150
2. Colglazier & Hoff, San Antonio, Tex. 291,510
3. Heldenfels Brothers, Rockport, Tex. 317,111

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	29.88 ac.	$100.00	$70.00	$80.00
2. Common road excavation	68,390 c. y.	.29	.40	.38
3. Rock road excavation	487 c. y.	1.50	1.50	3.00
4. Common borrow	86,073 c. y.	.29	.40	.38
5. Common channel excavation	69,793 c. y.	.30	.30	.28
6. Unclass. struct. excav. (culv.)	351 c. y.	2.50	3.00	2.50
7. Unclass. struct. excav. (bridges)	1,180 c. y.	4.00	3.00	8.00
8. Stripping	3,800 c. y.	.25	.25	.25
9. Overhaul	153,332 y. qtr.	.05	.10	.075
10. Sprinkling	5,400 M gal.	1.15	1.90	2.50
11. Rolling	245 hr.	4.00	4.00	5.00
12. Rolling	978 hr.	4.00	5.00	4.00
13. Rolling	464 hr.	4.00	5.00	4.00
14. Flexible base	19,605 c. y.	1.00	1.44	2.25
15. Blading	23 hr.	5.00	5.00	7.00
16. Prime coat (MC-1)	10,123 gal.	.10	.11	.15
17. Asphalt (OA-230)	23,500 gal.	.10	.10	.12
18. Aggregate	783 c. y.	3.50	4.25	5.50
19. Class A conc., culverts	39.78 c. y.	28.00	28.00	27.50
20. Class A conc., abutments and bents	456.73 c. y.	30.00	30.00	30.00
21. Class A conc., girders and slabs	844.38 c. y.	27.50	30.00	30.00
22. Class A conc., floating slabs	37.28 c. y.	23.00	24.00	32.50
23. Class A conc. for extending struct.	193.84 c. y.	28.00	34.00	32.50
24. Class D concrete	276 c. y.	15.00	16.00	26.50
25. Reinforcing steel	363,517 lb.	.09	.06	.058
26. Reinforcing fabric	4,700 lb.	.09	.10	.11
27. Structural steel	99,774 lb.	.09	.08	.10
28. Railing (Price's Creek Bridge)	560 l. f.	2.00	4.00	4.50
29. Blast plates	7,950 lb.	.15	.14	.18
30. 24-in. extr. str. rein. conc. pipe	42 l. f.	4.11	3.60	3.50
31. 30-in. extr. str. rein. conc. pipe	192 l. f.	5.25	4.60	4.50
32. Remove old structures (small)	9 ea.	75.00	50.00	100.00
33. Remove old structures (large)	2 ea.	800.00	2,200.00	2,000.00
34. 16-in. oct. precast conc. test piling	135 l. f.	7.30	7.00	8.50
35. 16-in. oct. precast conc. piling	2,091 l. f.	5.00	4.50	5.00
36. Railing (overpass)	830 l. f.	2.50	4.00	4.50
37. Concrete riprap	285 c. y.	15.00	16.00	20.00
38. Cement mortar riprap	87 c. y.	8.50	10.00	15.00
39. Block sodding	4,640 s. y.	.40	.50	.50
40. Grass retards	143 c. y.	2.35	2.00	3.50
41. Mulch sodding	2,500 c. y.	1.50	2.00	2.00
42. Rock retards	216 s. y.	2.00	.50	3.50
43. Conc. curb and gutters	320 l. f.	1.50	3.00	3.00
44. Right-of-way markers	60 ea.	1.50	3.00	2.00
45. Obliterate abandoned road	51.5 sta.	8.00	15.00	20.00
46. Remove old concrete (pavmt.)	315 s. y.	40.00	2.00	40.00
47. Remove guard fence	1,150 l. f.	.60	.25	.30
48. Remove, replace guard fence posts	168 ea.	1.00	2.00	1.50

BRIDGE, NEAR WHEATON, MINNESOTA

OWNER: Minnesota State Highway Department, St. Paul, Minn. E. J. Miller, bridge engineer.

PROJECT: 80 foot beam span bridge over the Mustinka River, one mile North of Wheaton, Traverse County, Minnesota. Concrete and steel rockers, concrete abutments, 30 foot roadway and concrete railings. Bridge No. 6459.

CONDITIONS: Contractor to furnish all materials and to complete work in 165 calendar days. (March 15, 1946) Rail and highway transportation facilities available to site of work. Wage rates stipulated are $1.10 to $1.40 for skilled labor; $.80 for semi-skilled, and $.60 for common labor per hour.

BIDS: Bids were received on September 28, 1945. Zantelli-Herbison, Inc., Ironton, made the only bid and the contract was awarded to them with a bid of $45,856.00.

Item	Quan.	Unit Price Bid	Amount
1. Class C excavation	1,000 c. y.	$0.65	$650.00
2. Class D.E. excavation	530 c. y.	1.00	530.00
2. Class W.E. excavation	440 c. y.	3.00	1,320.00
4. Sand-gravel fill in place	300 c. y.	1.00	300.00
5. Grade "A" concrete	590.6 c. y.	39.00	23,033.40
6. Grade "B" concrete	13.9 c. y.	50.00	695.00
7. Reinforcement bars	68,445 pds.	0.06	4,106.70
8. Structural metals	121,120 pds.	0.10	12,112.00
9. Name plates	2 ea.	10.00	20.00
10. 3-ply joint waterproofing	62 l. f.	0.80	49.60
11. Removal of old structure	Lump Sum	.....	3,000.00
12. Salvaged bit. mix. in place	40 c. y.	1.00	40.00

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BRIDGE AND APPROACHES NEW HAMPSHIRE

OWNER: New Hampshire State Highway Dept., Daniel H. Dickinson, Concord, chief engineer.

PROJECT: Construction of reinforced concrete, stone-faced, single-span bridge between Rochester, N. H. and Lebanon, Me., over Salmon Falls River. Length of span is 80 ft.

CONDITIONS: Contractor to furnish all materials and complete project in 150 working days. Rail and highway transportation facilities available to site. Prevailing wage rates are: skilled labor $1.10 per hour; semi-skilled, 85c.; and common labor, 75c.

BIDS: Fifteen bids were received January 11, 1945 ranging from the contract low of $74,070 to 114,787.

PARTIAL LIST OF BIDDERS:

1. O. W. Miller Co., Inc., Ludlow, Mass. (contract) $74,070
2. Kenneth E. Curran, Littleton, N. H. 75,243
3. Coleman Bros. Corp., Boston, Mass. 84,701
4. Tebaldi Supply Co., Inc., Indian Orchard, Mass. 85,391
5. Charles W. Riva, Inc., Boston, Mass. 87,229
6. Engineering Serv. & Constr. Co., Boston, Mass. 87,721
7. Berke Moore Co., Inc., Brookline, Mass. 89,771
8. San-Vel Contracting Co., Littleton, Mass. 89,893

Item	Quan.	Unit Prices (1)	(2)
1. Removing trees	7 ea.	$25.00	$35.00
2. Earth excavation	4,373 c. y.	.35	.60
3. Ledge excavation	100 c. y.	2.50	1.00
4. Unclass. trench excavation	70 c. y.	1.50	2.00
5. Unclass. struct. excavation	250 c. y.	15.00	1.00
6. Earth borrow	23,700 c. y.	.40	.35
7. Gravel borrow, bridge	5,200 c. y.	.45	.50
8. Fine grading	12,968 s. y.	.08	.05
9. Gravel borrow, base course	2,784 c. y.	.70	.10
10. Gravel, surface course	723 c. y.	.60	1.00
11. Class A bitum. surf treatment	4,000 gal.	.20	.15
12. Concrete, Class A	956 c. y.	24.00	22.50
13. Concrete, Class B	16 c. y.	20.00	22.50
14. Reinforcing steel	75,280 lb.	.055	.05
15. Ashlar masonry (random)	81 c. y.	135.00	150.00
16. Ashlar masonry (capstones)	13.1 c. y.	115.00	150.00
17. Mortar squared stone masonry	11.4 c. y.	137.00	150.00
18. 15-in. rein. conc. pipe	56 l. f.	2.00	3.00
19. 12-in. spiral cast iron culv. pipe	12 l. f.	5.00	5.00
20. 12-in. corr. metal pipe	34 l. f.	2.00	4.00
21. Remove and relay 15-in. pipe	105 l. f.	1.00	3.00
22. Paint waterproofing	719 s. y.	.30	.25
23. Riprap, Cl. C, 1'-6" thick	472 c. y.	7.00	20.00
24. Straight granite curb, Type A	602 l. f.	1.75	2.50
25. Curved granite curb, Type A	72 l. f.	2.00	3.15
26. Wood guard rail (Sing. 6"x8")	803 l. f.	1.60	.60
27. Wood guard rail (Doub. 3"x8")	624 l. f.	1.35	.65
28. Wood post markers	6 ea.	3.50	3.00
29. Drop inlets, type B	1 ea.	75.00	100.00
30. Drop inlets, type D	3 ea.	75.00	100.00
31. Granite curb inlets, type B	2 ea.	25.00	25.00
32. 18-in. half circle sluice	68 l. f.	2.50	4.00
33. 4-in. concrete sidewalk	17 s. y.	3.00	3.00
34. Project markers	2 ea.	10.00	10.00
35. Loam, 6-in. deep	5,035 s. y.	.30	.45
36. Sod	1,025 s. y.	1.00	1.00
37. Fertilizer for grasses	1,595 lb.	.05	.05
38. Grass seed	110 lb.	1.00	.75
39. Bounds, furnish and set	6 ea.	15.00	10.00
40. Stone dust sidewalk surf. crse.	7 ton	7.00	5.00

VIADUCT, TACOMA, WASHINGTON

OWNER: City of Tacoma, Wash., Burwell Bantz, city engr.

PROJECT: Construction of continuous, reinforced concrete, cellular-type girder viaduct on East 30th Street, East A to East B Street, in Tacoma, Wash. Overall length 320 ft., 305 ft. between abutments. In addition to the bridge structure, project includes removal of old structure, removal of old pavement, necessary excavation including backfill, cement concrete pavement, sidewalk and curb.

CONDITIONS: Contractor to furnish all material and complete work in 150 days. An existing timber trestle at the project site is being used for false-work. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.595 to $1.745 per hour; semi-skilled, $1.145 to $1.395; and common, $1.145.

BIDS: Eight bids were received February 14, 1945, ranging from the contract low of $52,889 to $69,778.

PARTIAL LIST OF BIDDERS:

1. Rumsey & Co., Seattle, Wash. (contract) $52,889
2. S. R. Gray & Son, Puyallup, Wash. 56,088
3. McKellar & Payne, Morton, Wash. 57,959

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old structure	Lump Sum	$2,500.00	$750.00	$1,500.00
2. Remove old pavement	40 s. y.	1.00	2.00	2.50
3. Struct. excav., incl. backfilling	442 c. y.	6.00	10.00	9.00
4. Class A concrete	668 c. y.	42.00	40.00	45.00
5. Class B concrete	144 c. y.	30.00	40.00	45.00
6. Class G concrete	54 c. y.	24.00	40.00	42.00
7. Steel reinforcing bars	182,990 lb.	.055	.06	.055
8. Structural steel	2,051 lb.	.25	.40	.25
9. Bearing rollers	Lump Sum	200.00	200.00	100.00
10. Reinforced conc. bridge railing	649 l. f.	4.50	6.00	4.00
11. Gravel backfill	25 c. y.	3.00	2.00	2.00
12. One-course conc. sidewalk (std. 14-day mix)	115 s.f.	.25	.40	.50
13. Cement conc. pavement (std. 14-day mix)	40 s. y	4.00	4.00	4.00
14. Integral concrete curb	32 l. f.	2.00	1.50	1.00

BRIDGE CONSTRUCTION, OREGON

OWNER: Oregon State Highway Commission, Salem, Oregon.

PROJECT: Pudding River Bridge Section of Pacific Highway East. Widen 0.25 mile highway; 590 lineal feet of concrete viaduct, and construct 120-foot steel bed arch span. Requires approximately 4,000 cubic yards roadway excavation; 1,500 cubic yards rock base; 1,100 tons asphaltic concrete; 1,300 cubic yards structural excavation; 2,000 feet untreated piling; 1,560 cubic yards concrete; 208,000 pounds metal reinforcement; 294,000 pounds structural steel, and 1,440 lineal feet metal handrail.

CONDITIONS: Contractor to furnish material and complete project in 365 calendar days. Minimum wage rates are: Skilled Labor $1.25 per hour; Intermediate, Group 1, $1.15 per hour; Intermediate, Group 2, $1.00 per hour, and Common Labor, $0.85 per hour.

BIDS: Five bids were received October 29, 1945, ranging from $147,847 to $204,396.

PARTIAL LIST OF BIDDERS:

1. J. F. Johnson, Newberg $147,847
2. Kern and Kibbe, Portland 175,575
3. Marine Contractors, Inc., Portland 184,570

Item	Quantity	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	All Specified	$1,000.00	$750.00	$2,008.00
2. Trench excavation	40 cu. yds.	2.00	2.00	2.50
3. Borrow excavation	3,100 cu. yds.	0.60	0.50	0.63
4. General excavation	1,000 cu. yds.	0.60	0.60	1.00
5. Short overhaul	13,900 yd. stas.	0.02	0.02	0.01
6. Long overhaul	120 "C" yd. sta.	0.40	0.50	1.00
7. Rounding cutbanks	400 lin. ft.	0.25	0.20	0.16
8. Finishing roadbed and slopes	0.25 mile	600.00	400.00	560.00
9. 12" corrugated metal pipe	160 lin. ft.	2.00	2.00	2.35
10. Concrete inlets	5 only	30.00	40.00	50.00
11. Concrete walks curb	10 cu. yds.	20.00	25.00	25.00
12. 3"-0" gravel in base	1,240 cu. yds.	1.75	3.00	3.00
13. 1'-0" gravel in base and shoulders	260 cu. yds.	2.75	4.00	4.00
14. Spriakling	40 M-gals.	3.00	3.00	2.00
15. Class "B" asphaltic concrete	1,100 tons	9.00	9.90	9.30
16. Shoring, cribbing, etc.	All Required	4,000.00	7,583.40	13,000.00
17. Structural excavation	1,300 cu. yds.	3.00	2.20	2.70
18. Structural excavation below elevation	100 cu. yds.	5.00	5.00	7.00
19. Furnish untreated piles	2,000 lin. ft.	0.40	0.30	0.44
20. Drive piles	120 only	10.00	20.00	25.00
21. Class "A" concrete	1,560 cu. yds.	32.00	44.00	32.00
22. Metal reinforcement	208,000 lbs.	0.058	0.07	0.06
23. Structural steel	294,000 lbs.	0.108	0.134	0.165
24. Metal handrail	1,440 lin. ft.	8.00	5.90	8.00
25. Preparation of old bridge and provisions for traffic	All Specified	7,500.00	10,472.00	20,580.00

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BRIDGE AND APPROACHES MASSACHUSETTS

OWNER: Massachusetts Dept. of Public Works, Boston.

PROJECT: Construction of bridge and approaches over Connecticut River near West Springfield and Agawam, Mass. Bridge is steel beam type, continuous spans, with concrete abutments on steel piles. Of the four spans, two are 100-ft. long, and two are 67-ft. long. Overall length 334 ft. Approaches to be bituminous macadam pavement. Includes all necessary drainage structures, sidewalks, and curbing.

CONDITIONS: Contractor to furnish all materials except those which are to be removed from present location and reset as designated. Time for completion: October 20, 1946. Rail and highway transportation facilities available to site of work. Wage rates are: skilled labor, $1.25 to $1.75 per hour; semi-skilled, 85c. to $1.50; and common labor, 90c.

BIDS: Eight bids were received June 5, 1945, ranging from the contract low of $203,377 to $269,451.

PARTIAL LIST OF BIDDERS:

1. Daniel O'Connell's Sons, Inc., Holyoke, Mass. (contract) $203,377
2. Coleman Bros. Corp., Boston, Mass. 205,827
3. Cayuga Constr. Co., New York, N. Y. 227,746

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	0.5 ac.	$225.00	$200.00	$100.00
2. Roadway earth excavation	2,400 c. y.	.89	.50	.65
3. Rock excavation, Class A	50 c. y.	1.12	5.00	4.00
4. Unclassified excavation	5,300 c. y.	3.10	1.50	1.50
5. Trench excavation	660 c. y.	2.25	1.75	2.20
6. Class B rock excavation	200 c. y.	9.00	5.00	6.00
7. Rein. conc. surface excav.	90 c. y.	2.25	5.00	5.50
8. Trees removed	8 ea.	28.00	13.00	15.00
9. Stump removed	1 ea.	17.00	13.00	20.00
10. Ordinary borrow	2,500 c. y.	.56	.65	.65
11. Gravel borrow	3,400 c. y.	1.35	1.00	1.50
12. Sand borrow	250 c. y.	3.90	2.00	1.60
13. Cinder borrow	750 c. y.	1.75	2.00	1.85
14. Stripping gravel pits	340 c. y.	.10	.10	.20
15. Scarifying and reshaping	200 s. y	.22	.50	.50
16. Fine grading, rolling and finishing	14,000 s. y.	.07	.08	.10
17. Crushed stone for base course	1,400 ton	1.92	2.50	2.00
18. Calcium chloride for surf. trtmt.	10,000 lb.	.03	.03	.04
19. Cr. stone for macadam surf.	950 ton	2.42	3.00	2.25
20. Bitum. for macadam surfacing	9,500 gal.	.15	.13	.12
21. Bitum. for macad. surf. (seal)	5,500 gal.	.13	.13	.11
22. Cl. J. sheet asphaltic conc. (J-3)	240 ton	9.10	10.00	10.00
23. Oil treated stone	22 ton	3.42	5.00	7.00
24. Bitum. mat'l. for seal coat	340 gal.	.17	.13	.12
25. Cl. A cem. conc. masonry	525 c. y.	23.30	27.00	35.00
26. Cl. B. cem. conc. masonry	1,501 c. y.	15.80	24.00	28.00
27. Cl. C. cem. conc. masonry	16 c. y.	14.60	20.00	25.00
28. Cl. D. cem. conc. masonry	87 c. y.	38.00	35.00	50.00
29. Steel reinforcement, structures	152,000 lb.	.047	.06	.05
30. Structural steel	975,000 lb.	.078	.0775	.08
31. Bituminous damp-proofing	1,670 s. y.	.11	.30	.50
32. Field stone masonry in cem. mortar.	45 c. y.	14.80	13.00	35.00
33. Riprap	1,300 c. y.	4.90	3.00	6.00
34. Remove present superstructure	Lump Sum	1,930.00	1,000.00	5,000.00
35. Metal bridge railings	588 l. f.	16.25	15.00	12.00
36. Steel piles	1,300 l. f.	2.80	3.50	2.50
37. Steel pile splices	5 ea.	112.00	40.00	25.00
38. Galvanized nose angles	4,400 lb.	.10	.13	.15
39. Catch basins	8 ea.	118.00	100.00	175.00
40. Special manhole	1 ea.	310.00	200.00	175.00
41. Catch basins, manholes or leaching basins adjusted to line or grade	9 ea.	11.00	25.00	10.00
42. Frames and grates or frames and covers removed and stacked	5 ea.	3.50	10.00	5.00
43. Furn. and install special 12-in. traps	4 ea.	8.00	30.00	50.00
44. 12-in. rein. conc. pipe	390 l. f.	1.31	1.75	2.00
45. 24-in. hvy. wt. cast iron pipe	90 l. f.	8.00	7.00	8.00
46. 10-in. vitr. clay or cem. conc. pipe	70 l. f.	.65	1.00	1.10
47. Sub-drains with 10-in. perf. bit. coated corr. metal pipe	170 l. f.	3.10	2.00	3.00
48. Hwy. guard bridge anchors	3 ea.	28.00	30.00	30.00
49. Individual posts	4 ea.	4.50	5.00	4.50
50. Hwy. guard Type (4x10)W1W	230 l. f.	1.70	1.50	1.75
51. Chain link fence, remove and stack	90 l. f.	.56	1.00	.75
52. Chain link fence, remove and reset	210 l. f.	.56	1.20	1.50
53. Gran. curb Type VA-3, straight	775 l. f.	1.85	1.60	2.00
54. As above, curved	330 l. f.	2.36	2.20	2.50
55. Gran. curb, Type VA, str., 6x11-in.	743 l. f.	1.65	1.60	2.00
56. Gran. curb inlets	7 ea.	22.90	20.00	75.00
57. Granite curb inlets (curved)	1 ea.	31.00	25.00	80.00
58. Gran. curb corners, Type B	15 ea.	16.00	15.00	20.00
59. Concrete edg., Type SFA straight	220 l. f.	1.45	2.00	1.20
60. As above, curved	170 l. f.	2.00	2.50	1.60
61. Curb, remove and reset	150 l. f.	.56	.60	1.60
62. Curb, remove and stack	450 l. f.	.34	.30	.80
63. Granolithic walks	150 s. y.	3.05	3.00	4.50
64. Bitum. conc. walk surface	50 ton	9.50	10.00	10.00
65. Cr. stone base for walks	120 ton	2.50	2.50	2.50
66. Bitum. for walk base (asph.)	950 gal.	.16	.13	.14
67. Traffic signal conduit, Type BF or CA	1,100 l. f.	.68	1.00	.50
68. Granite bounds (lettered)	8 ea.	19.00	13.00	20.00
69. Bounds, remove and reset	2 ea.	11.00	10.00	15.00
70. Peastone for driveways	40 ton	3.40	4.00	3.50
71. Lighting	Lump Sum	3,050.00	2,700.00	2,500.00
72. Stone steps, remove and reset	2 ea.	5.60	50.00	30.00
73. Loam borrow	500 c. y.	2.25	2.00	2.50
74. Seeding	2,300 s. y.	.06	.10	.10
75. Lawn sodding	370 s. y.	1.40	1.00	1.25

HIGHWAY IMPROVEMENTS AND BRIDGES, WASHINGTON

OWNER: Washington State Highway Dept., Olympia.

PROJECT: Clearing, grading, surfacing and construction of six bridges on the Austin Pass Branch of Primary State Highway No. 1, from Glacier to Mt. Baker in Whatcom County, Wash.

CONDITIONS: Contractor to furnish all materials and complete work in 180 calendar days. Highway transportation available to site of work. Wage rates are: skilled labor $1.48 to $1.745 per hour; semi-skilled, $1.15 to $1.48; and common labor, $1.15.

BIDS: Ten bids were received April 3, 1945, ranging from contract low of $67,613 to $107,132.

PARTIAL LIST OF BIDDERS:

1. Axel Osberg, Seattle, Wash. (contract) $67,613
2. Scheumann & Johnson, Seattle, Wash. 69,748
3. M. P. Butler, Seattle, Wash. 71,299

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	Lump sum	$1,500.00	$800.00	$2,000.00
2. Unclassified excavation (incl. haul)	380 c. y.	1.75	2.00	1.50
3. Common excavation (incl. haul)	1,390 c. y.	1.00	2.00	1.00
4. Solid rock excav. (incl. haul)	520 c. y.	4.00	2.00	2.50
5. Finish roadway	8.6 sta.	20.00	50.00	20.00
6. Sel. roadway borrow, incl. haul	530 c. y.	2.50	4.00	3.00
7. Crushed stone surf. top course in place on rdwy. from stockpiles	250 c. y.	3.50	5.00	2.50
8. Loose riprap, Class A, in place	20 c. y.	5.00	5.00	4.00
9. Construct and remove 5 detours	Lump sum	5,000.00	1,000.00	6,000.00
10. Structural excavation	1,094 c. y.	3.50	5.00	10.00
11. Concrete, Class A, in place	445 c. y.	45.00	45.00	38.70
12. Concrete, Class B, in place	378 c. y.	40.00	45.00	38.70
13. Steel reinforcing bars, in place	138,000 lb.	.06	.07	.06
14. Structural steel, in place	5,000 lb.	.07	.30	.15
15. Rein. conc. bridge railing, in place.	658 l. f.	6.50	6.00	4.00
16. Bridge drains	3 ea.	50.00	40.00	50.00
17. Remove six existing structures	Lump sum	2,500.00	1,775.00	3,000.00

BRIDGE CONSTRUCTION OREGON

OWNER: Oregon State Highway Commission, Salem, Oregon.

PROJECT: Bridge and culverts on Troutdale-Wahkeena Section, Columbia River Highway. Approximately 630 cubic yards Excavation; 720 cubic yards Concrete; 118,000 pounds Metal Reinforcement, and 75 lineal feet Metal Handrail.

CONDITIONS: Contractor to furnish materials and complete project in 275 calendar days. Minimum wage rates are: Skilled Labor, $1.25 per hour; Intermediate Labor, Group 1, $1.15 per hour: Intermediate Labor, Group 2, $1.00 per hour; Common Labor, $0.85 per hour.

BIDS: Ten bids were received October 29, 1945, ranging from $32,467.50 to $47,860.00.

PARTIAL LIST OF BIDDERS:

1. Archie R. Averill, Portland, Oregon $32,467.50
2. C. J. Eldon, Portland, Oregon 33,055.00
3. Lockyear and White, Woodland, Washington 38,022.50

Item	Quantity	Unit Prices (1)	(2)	(3)
1. Structural excavation	630 cu. yds.	$5.00	$4.00	$5.00
2. Class "A" concrete	720 cu. yds.	30.00	30.00	37.00
3. Metal reinforcement	118,000 lbs.	0.06	0.07	0.065
4. Metal handrail	75 lin. ft.	8.50	9.00	7.50

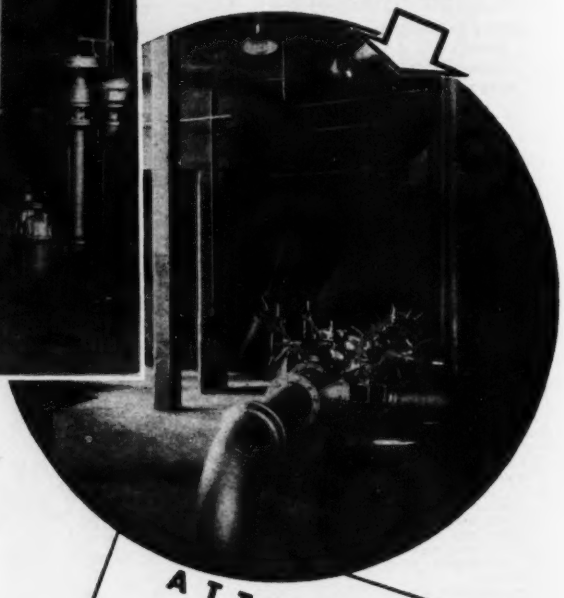
METERING SLUDGE GAS DEMONSTRATES ECONOMIES

CLEVELAND PLANT SAVES $25,000 YEARLY OVER COST OF PURCHASED FUEL*

*Authority—*The American City*, Page 157, October 1945

EMCO No. 4 Sludge Gas Meters in Cleveland plant.

A multitude of Nordstrom Lubricated Plug Valves installed on flow lines in and about the Cleveland plant provide positive control, leak resistance and quick, easy operation.



A study at the Cleveland, Ohio, Southerly Treatment Plant reveals 184,093,000 cubic feet of sludge gas utilized during 1944. This fuel was consumed to heat water; to incinerate sludge and for space heating; to operate two electric power producing engines. Purchased gas to do this same work would have cost $25,000.00. In conducting the survey at the Cleveland plant, figures were readily available, for gas lines were fitted with EMCO Sludge Gas Meters. The metered recordings of total gas generated, gas burned, and gas wasted quickly demonstrated the economies involved. These EMCO Meters also are in daily use guiding plant operators towards the most efficient utilization of the fuel at hand.

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BRIDGE OVER SPA CREEK ANNAPOLIS, MARYLAND

OWNER: Maryland State Roads Commission. Hardesty and Hanover, consulting engineers.

PROJECT: Construction of a bridge over Spa Creek between Eastport and Annapolis, Anne Arundel County, Maryland. Bridge measures 832 ft. from the North abutment to the South abutment. Steel I-beam construction on 12 concrete-pile bents, 55 ft. apart, plus two piers supporting a double leaf steel bascule with 40-ft. waterway clearance and a 15-ft. headway clearance from mean low water. The bridge will support a 26-ft. clear roadway with two sidewalks six feet wide.

BIDS: Six bids were received on January 17, 1946, ranging from the contract low of $667,696.50 to $922,253.00.

LIST OF BIDDERS:

1. McLean Contr. Co., Baltimore, Md. (contract) .. $667,696.50
2. Whiting-Turner Contr. Co., Baltimore, Md. 747,850.93
3. Johnson, Drake & Piper, Inc., N.Y.C. 793,559.50
4. Tuller Construction Co., Red Bank, N. J. 798,864.00
5. Baltimore Contr. Co., Baltimore, Md. 824,041.00
6. Melwood Contr. Corp., N.Y.C. 922,253.00

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Maintenance of Traffic	L.S.	$1,500.00	$106,050.00	$5,000.00
2. Class #2 Excavation	350 cu. yd.	2.00	2.85	3.00
3. Class #3 Excavation	180 cu. yd.	5.00	32.20	4.00
4. Class #4 Excavation	70 cu. yd.	6.00	24.70	6.00
5. Borrow Excavation	3,100 cu. yd.	1.00	1.26	2.00
6. Tamped Fill	610 cu. yd.	1.00	1.50	2.00
7. Selected Backfill	150 cu. yd.	7.00	6.60	4.00
8. Porous Wall Backfill	40 cu. yd.	10.00	7.00	8.00
9. Unt. Cl. A. Timber Piles	1,890 lin. ft.	1.20	1.89	1.50
10. Unt. Tim. Test Piles	315 lin. ft.	2.00	2.94	3.50
11. Tr. Cl. A. Piles—Fenders	4,000 lin. ft	2.50	3.15	4.00
12. Tr. Timber in Fenders	12 M.B.M.	350.00	415.00	400.00
13. Metal in Fenders	14,000 lbs.	.40	.26	.15
14. 24 in. Prec. Conc. Piles	11,030 lin. ft.	11.00	12.86	11.50
15. 24 in. Prec. Conc. Test Piles	470 lin. ft.	15.00	19.95	20.00
16. Load Tests—24 in. Precast Conc. Test Piles	2 ea.	3,000.00	1,155.00	2,000.00
17. 18 in. Prec. Con. Piles	2,975 lin. ft.	8.00	9.24	8.00
18. 18 in. Prec. Con. Test Piles	75 lin. ft.	10.00	10.50	10.00
19. Prot. Cont-Con. Work	2,000 SF	4.00	1.20	1.00
20. Dampproofing	2,000 SF	.20	.12	.10
21. Cast Iron Bal. Blocks	20,000 lb.	.15	.10	.10
22. Cl. X. Found. Seal	40 cu yd.	25.00	27.85	40.00
23. Cl. A. Conc. in Abut. and retaining walls	450 cu. yd.	50.00	39.50	55.00
24. Cl. A. Conc. in Pile Caps	140 cu. yd.	50.00	58.80	55.00
25. Cl. A. Con. Rdway—Slabs—bridge	620 cu. yd.	60.00	59.50	50.00
26. Cl. A. Con. bascule Piers & Houses	560 cu. yd.	60.00	63.50	50.00
27. Cl. A. Con. Counterwghs.	60 cu. yd.	40.00	37.25	40.00
28. Rein. Steel Bars	335,000 lb.	.10	.057	.08
29. Fab. Struct. Steel in Bas. Spans, towers, count	330,000 lb.	.18	.1443	.15
30. Fab. Struct. Steel in Flank Spans and Approaches	1,100,000 lb.	.105	.082	.11
31. Miscellaneous Metal	20,000 lb.	.40	.171	.30
32. Open Grat. In Rdway	1,360 SF	4.50	3.80	3.00
33. Open Grat. in Sdwalk	440 SF	4.00	3.08	3.10
34. Fill Grat. in Sdwalk	120 SF	5.00	3.60	3.50
35. Water Service Line	L.S.	3,800.00	3,864.00	10,000.00
36. Control House	L.S.	15,000.00	14,981.00	30,000.00
37. Trunnions and Bearings	1,200 lb.	.70	.60	1.00
38. Operating Machinery	35,000 lb.	1.00	.825	1.25
39. Traffic Gates	L.S.	2,500.00	3,150.00	10,000.00
40. Lamp Poles	16 each	75.00	95.10	2,400.00
41. Roadway Lighting Units	16 each	35.00	38.13	50.00
42. Roadway Light. System	L.S.	3,000.00	3,543.20	15,000.00
43. Elc. Equip. Bas. Span	L.S.	30,000.00	30,924.00	79,000.00
44. Bridge Operator	L.S.	500.00	1,925.00	2,500.00
45. Clearing and Grubbing	L.S.	500.00	368.00	1,000.00
46. Class #1 Excavation	780 cu. yd.	1.00	1.26	1.25
47. Rem. Exist. Masonry	5 cu. yd.	15.00	20.00	50.00
48. Mac. Base Course—6 in.	350 SY	2.00	1.74	1.50
49. Gravel Surface Course	100 SY	1.70	1.58	1.00
50. Gravel Surf. Crse. Maint. of Traffic	50 cu. yd.	4.00	6.00	6.00
51. Pen. Mac. Surface Crse	350 SY	1.50	1.37	1.50
52. Bit. Mat. for Pen. Mac	900 Gal.	.20	.21	.25
53. Reinf. Cem. Conc. Pavement 9-7-9-Cl. A. Reg.	1,050 SY	4.25	4.36	5.00
54. Reinf. Cem. Conc. Pavement 9 in. Class A. Reg.	1,000 SY	4.75	4.73	5.50
55. Reinf. Cem. Conc. Pavement 9 in. Class X. Early Str.	180 SY	5.50	5.52	6.00
56. 15 in. A.C.C. Metal Pipe	81 lin. ft.	3.00	2.89	4.00
57. 18 in. A.C.C. Metal Pipe	136 lin. ft.	3.50	3.41	4.50
58. 13 in. rise Span and 22 in.—A.C.C. M. Pipe	136 lin. ft.	4.50	4.10	5.00
59. 18 in. Rise and 29 in. Span A.C.C. M. Pipe	196 lin. ft.	5.50	5.25	7.00
60. Rem. Old Pipe Culverts	50 lin. ft.	1.50	1.58	1.50
61. Relaid Old Pipe Culvert	50 lin. ft.	2.00	1.58	1.50
62. Cl. A. Con. Pipe Endwalls	3 cu. yd.	60.00	63.00	80.00
63. Pl. Com. Curb and Gutter Class A Reg.	1,180 lin. ft.	2.20	2.10	2.25
64. Conc. Sidewalk Reg. Conc. Class A	4,900 SF	.50	.45	.50
65. Guard Rail Chain	190 lin. ft.	1.00	.95	2.00
66. Cedar Posts	46 each	6.00	6.30	5.00
67. Manhole, Frame and Cover	1 each	60.00	157.50	500.00
68. Type H. Comb. Inlets	8 each	40.00	131.25	450.00
69. Dredging	1,800 cu. yd	1.50	2.58	3.00
70. Rem. and Disp. Ex. bridge	L.S.	5,000.00	20,351.00	36,000.00
71. Stnd. Cl. and E. Comb. Inlet	2 each	150.00	157.50	250.00

WATER SUPPLY LINE, BETHLEHEM, PENNSYLVANIA

OWNER: City of Bethlehem, Pa., Dept. of Engineering.

PROJECT: Construction of 34-in. reinforced concrete water supply line from East Third St. to Dewberry Ave. and Main St. Involves furnishing and laying of 34-in. and 20-in. concrete pressure pipe, 30-in. cement-lined cast iron pipe, 12- and 20-in. bell and spigot cast iron pipe, valve chambers and valve box, 84-in. liner plate tunnel 160 ft. long, and necessary rock and earth excavation. Also concrete for concrete-lined tunnel.

CONDITIONS: Contractor to furnish all materials. Wage rates to be paid are those prevailing in area.

BIDS: Five bids were received April 10, 1945, ranging from the contract low of $474,123 to $598,193.

PARTIAL LIST OF BIDDERS:

1. Francis A. Canuso & Son, Philadelphia, Pa. (contract) $474,123
2. James A. Driscoll Co., Philadelphia, Pa. 541,123
3. Kaufman Construction Co., Philadelphia, Pa. 570,335

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 34-in. concrete pressure pipe	10,118 l. f.	$21.00	$23.25	$20.00
2. 20-in. concrete pressure pipe	1,805 l. f.	11.00	17.80	15.00
3. 30-in. c. i. pipe, Class F, cmt-lined	2,500 l. f.	49.00	46.30	60.00
4. 20-in. b. & s. cast iron pipe, Cl. D.	140 l. f.	26.00	15.00	60.00
5. 12-in. b. & s. cast iron pipe, Cl. D.	900 l. f.	7.00	6.00	10.00
6. As above, Class B	1,000 l. f.	6.50	5.00	8.00
7. Valve chamber, Type A, complete.	1 ea.	12,500.00	12,000.00	13,000.00
8. Valve chamber, Type B-30, compl.	1 ea.	14,000.00	12,000.00	16,000.00
9. Valve chamber, Type E, complete.	4 ea.	5,000.00	4,750.00	5,000.00
10. Valve chamber, Type F-1, compl.	1 ea.	650.00	300.00	400.00
11. Valve chamber, Type F-2, compl.	2 ea.	550.00	300.00	550.00
12. Valve box with 10-in. blow-off tee and 10-in. flanged gate valve	1 ea.	280.00	600.00	250.00
13. Conc. for lined tunnel (1:2:4 mix).	630 c. y.	36.00	40.00	55.00
14. Rock excavation in tunnel	1,200 c. y.	15.00	50.00	45.00
15. Rock excavation in trenches	500 c. y.	20.00	6.00	15.00
16. 84-in. liner plate tunnel	160 l. f.	19.00	75.00	110.00
17. Extra earth excavation	200 c. y.	3.00	4.00	5.00

CONCRETE RESERVOIR, SEATTLE, WASHINGTON

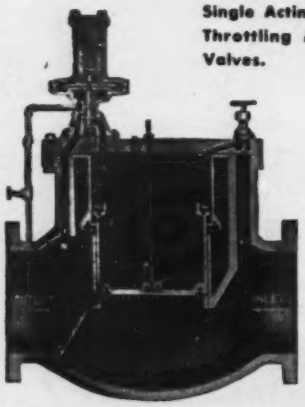
OWNER: City of Seattle, Wash. C. L. Wartelle, city engr.

PROJECT: Construction of Magnolia Manor Reservoir, a concrete structure in Magnolia District, Seattle, Wash. Involves all necessary clearing and grubbing, surface stripping, excavation and embankment, high early strength cement in concrete for reservoir lining, piping (cast iron), gate valves, valve chambers, screen cages, etc., needed to complete work.

CONDITIONS: Contractor to furnish all material and complete work in 150 days. Highway transportation facilities available to site of work. Wage rates are: skilled labor, $1.545 to $1.70 per hour; semi-skilled, $1.145 to $1.495; and common, $1.145.

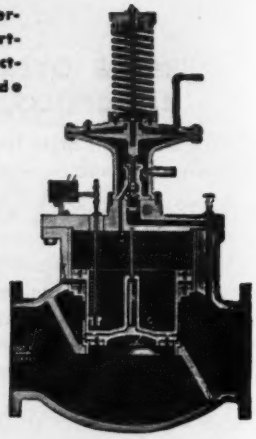
(*Continued on following page*)

Golden-Anderson Single Acting Semi-Throttling Altitude Valves.



For New Construction or Rehabilitation

Golden-Anderson Stop Starter Single Acting Altitude Valves.



STANDARDIZE ON

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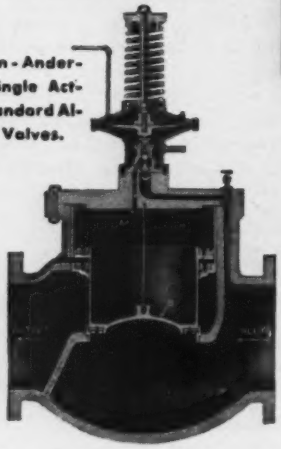
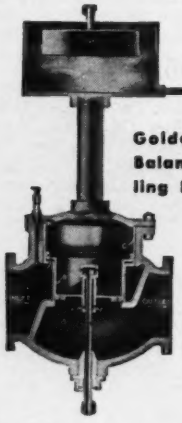
VALVES

for Engineered Protection

Golden-Anderson Single Acting Standard Altitude Valves.



Golden-Anderso Balanced Controlling Float Valves.



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CONCRETE RESERVOIR, SEATTLE, WASHINGTON

(*Continued from preceding page*)

BIDS: Eleven bids were received January 18, 1945, ranging from the contract low of $61,139 to $113,311. These bid totals include city department charges of $2,000 for engineering, and $50 for advertising.

LIST OF BIDDERS:

1. L. Coluccio Co., Seattle, Wash. (contract).... $61,139
2. Wick & Dahlgren, Seattle, Wash..... 63,755
3. Rumsey & Co., Seattle, Wash..... 67,884
4. Argentieri & Colarossi, Seattle, Wash..... 68,838
5. Valley Construction Co., Seattle, Wash..... 70,310
6. R. L. Moss & Co., Zenith, Wash..... 71,523
7. Superior Construction Co., Seattle, Wash..... 79,077
8. M. P. Butler, Seattle, Wash..... 83,376
9. L. Romano Engr. Co., Seattle, Wash..... 84,244
10. MacRae Brothers, Seattle, Wash..... 95,023
11. Lidral Constr. Co., Seattle, Wash..... 113,311

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	6.9 ac.	$250.00	$150.00	$100.00
2. Surface stripping	6,000 c. y.	.30	.27	.30
3. Excavation and embankment (rolled embankment, 23,500 c. y.)	35,000 c. y.	.40	.43	.40
4. Slope dressing	1,500 c. y.	.70	1.00	1.00
5. Concrete, Class S.S. high early str. cement, in reservoir lining	1,300 c. y.	18 00	17.90	20.00
6. Sheet copper in contract. joints	5,415 lb.	.65	.40	.67
7. Joint material	8,600 l. f.	.12	.22	.15
8. Reinforcing steel	200 lb.	.25	.10	.10
9. Structural steel	114 lb.	.25	.20	1.00
10. 16-in. c. i. pipe, with lugs, Cl. 200	85 l. f.	20 00	20 40	30 00
11. 16-in. c. i. pipe, without lugs, Cl. 200	279 l. f.	9 00	10 00	9 00
12. 12-in. c. i. pipe, with lugs, Cl. 200	65 l. f.	9 50	13 75	22.00
13. 12-in. c. i. pipe, without lugs, Cl. 200	234 l. f.	6 00	8 00	16.25
14. 8-in. c. i. drain pipe	175 l. f.	4 50	5 80	4 00
15. 4-in. cast iron washout pipe	185 l. f.	3 50	4 00	3.50
16. 4-in. galv. steel washout pipe	200 l. f.	2 50	3 00	3.00
17. 16-in. gate valve	1 ea.	550 00	633 00	650.00
18. 12-in. gate valve	1 ea.	350 00	415 00	425 00
19. 2½-in. flanged brass hose valves	2 ea.	35.00	60.00	31.50
20. Special valve chamber for 16-in. gate valve	1 ea.	800.00	740.00	500.00
21. Special valve chamber for 12-in. gate valve	1 ea.	750 00	640 00	450 00
22. Standard valve chamber	1 ea.	90 00	100 00	500 00
23. Screen eaves	2 ea.	50.00	150 00	70 00
24. Shackle rods	20 lb.	.25	.20	1.00
25. 6-in. sewer pipe drain	335 l. f.	.65	2 75	1.00
26. Special inlets	2 ea.	35 00	60 00	50 00
27. Concrete blocking	1 c. y.	14.00	30 00	50 00
28. Concrete gutter	440 l. f.	.50	1.00	1.50

GRAVITY TYPE CONCRETE DAM NORWALK, CONNECTICUT

OWNER: First Taxing District, Water Department of Norwalk. Connecticut: Mr. John E. Riorden, city engineer: Buck, Seifert and Jost, Consulting Engineers.

PROJECT: Construction of a gravity type concrete dam on the Silvermine River to supplement the existing storage on this river. The dam is to be founded on a rock foundation: it will have a maximum height of about 100 ft. above the foundation with an over-all length of approximately 1,000 ft. The construction site is 8 miles northwest of Norwalk, Conn.

CONDITIONS: Contractor to furnish all materials and complete work in 400 consecutive calendar days. Rail, highway and water (Norwalk) transportation facilities available. No wage rates were specified but are estimated to be from $1.00 to $1.75 per hour for common and skilled labor respectively. (It will be noted that the unit prices shown below for concrete do not include the cost of cement which is bid separately under item 17.)

BIDS: Thirteen bids were received September 19, 1945, ranging from the contract low of $939,240 to $1,734,750.

LIST OF BIDDERS:

1. E. W. Foley Inc., Brooklyn, N. Y. (contract) $939,240
2. B. Perini & Sons, Inc., Framingham, Mass. 976,220
3. C. W. Blakeslee & Sons, Inc., New Haven, Conn... 1,007,047
4. A. I. Savin Const. Co., New Haven, Conn..... 1,011,490
5. Walsh Const. Co., New York, N. Y..... 1,074,300
6. Cayuga Const. Corp., New York, N. Y..... 1,188,350
7. Garafano Const. Co., Mt. Vernon, N. Y..... 1,193,310
8. P. T. Cox Const. Co., New York, N. Y..... 1,196,100
9. Stock Const. Corp., New York, N. Y..... 1,245,600
10. Woodcrest Const. Co., New York, N. Y..... 1,267,250
11. Seaboard Const. Co., Mt. Kisco, N. Y..... 1,315,502
12. Morrison-Knudsen Co. Inc., New York, N. Y..... 1,667,479
13. Spencer, White & Prentis Inc., New York, N. Y.... 1,734,750

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cofferdams and pumping	Lump Sum	$20,000.00	$50,000.00	$111,515.00
2. Earth excavation and backfill	50,000 c. y.	2.00	1.85	1.71
3. Rock excavation	5,500 c. y.	5.00	5.00	5.50
4. Class A concrete masonry	500 c. y.	22.00	51.40	18.50
5. Class B concrete masonry	73,500 c. y.	7.00	7.10	7.05
6. Steel reinforcement added or omitted	2,000 lbs.	.07	.06	.06
7. Furnishing and installing metal water stops	50,000 lbs.	.23	.10	.10
8. Drilling holes in rock	300 l. f.	6.00	1.00	.90
9. Furnishing and placing grout	200 c. f.	10.00	2.00	1.30
10. Furnishing and placing gravel	300 c. y.	4.80	5.50	4.00
11. Furnishing and placing rip rap	500 s. y.	4.40	2.00	1.50
12. Furnishing and installing sluice gates, valves and pipe fittings	Lump Sum	9,200.00	14,000.00	11,422.50
13. Furnishing and installing miscellaneous metal work	Lump Sum	8,000.00	7,500.00	12,044.00
14. Roadways and paths	1,200 s. y.	2.10	1.00	1.50
15. Seeding	5 acr.	500.00	400.00	1,000.00
16. Cleaning up	Lump Sum	5,000.00	5,500.00	2,500.00
17. Furnishing Portland cement	80,000 bbls.	2.75	2.75	2.85

SEWER EXTENSION, WASHINGTON

OWNER: City of Pasco, Wash.

PROJECT: Extending sewer lines in Pasco, Wash., involving approximately 17,000 linear feet of sewer pipe, necessary wye branch connections and manholes, paving cuts, trench excavation and backfill, and two sewer crossings under tracks.

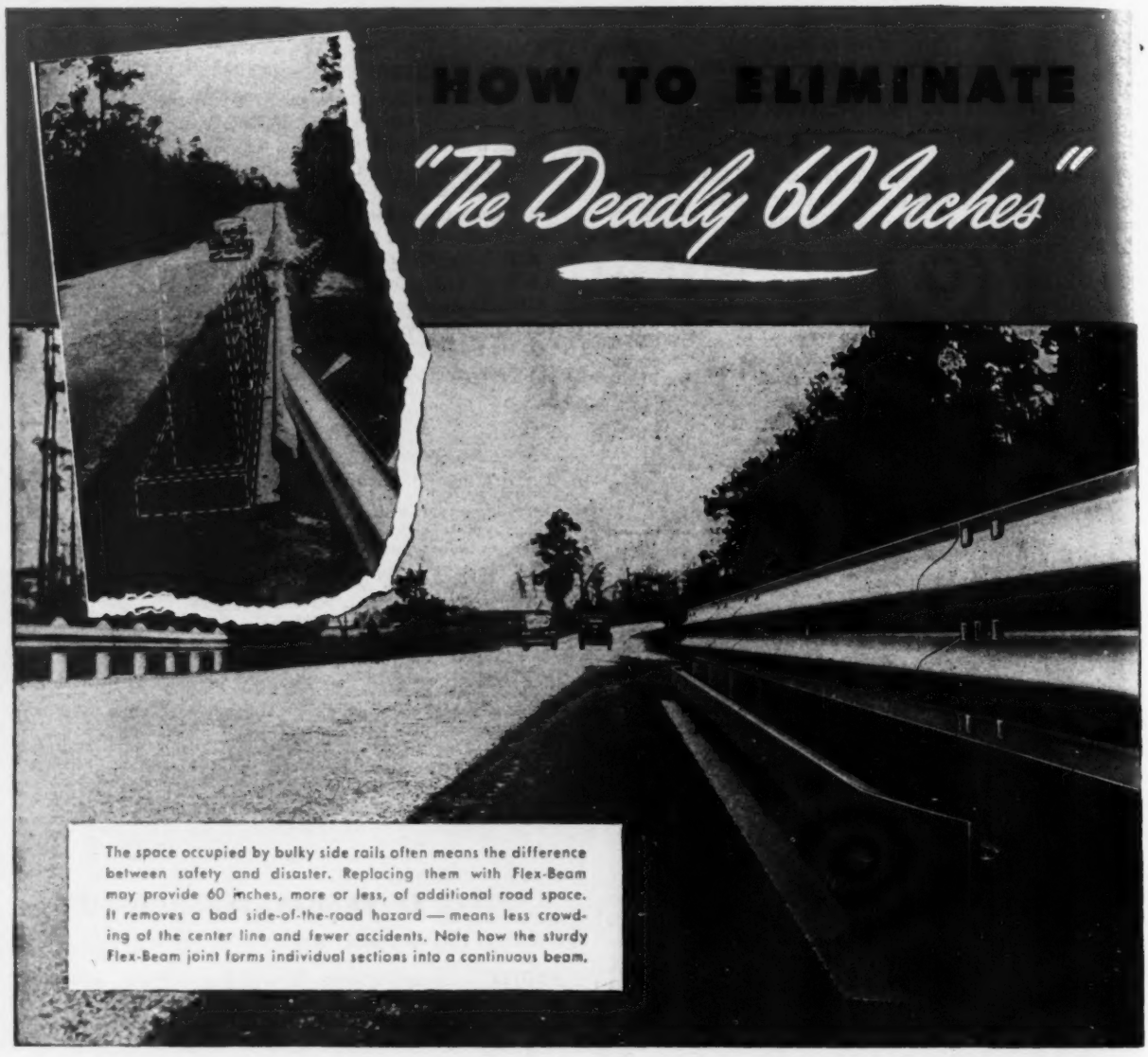
CONDITIONS: Contractor to furnish all materials and complete work in 90 days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.35 to $1.60 per hour; semi-skilled, $1.15 to $1.25; and common, 95c.

BIDS: Six bids were received April 17, 1945, ranging from the contract low of $41,286 to $73,715.

LIST OF BIDDERS:

1. Matt Malaspina & Co., Seattle, Wash. (contract)... $41,286
2. V. F. Walters, Seattle, Wash..... 44,691
3. Valley Constr. Co., Seattle, Wash..... 51,682
4. Gallagher, Kirk & Thomas, Tacoma, Wash..... 52,923
5. B. H. Sheldon, Spokane, Wash..... 54,698
6. Goerig & Philp, Seattle, Wash..... 73,715

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Paving cuts	500 s. y.	$5.40	$3 00	$2.00
2. Trench excavation, backfill	16,500 c. y.	.80	1 00	.80
3. Sewer pipe, 15-in.	1,960 l. f.	1 40	1 65	2.42
4. Sewer pipe, 12-in.	2,870 l. f.	1.07	1.15	1.83
5. Sewer pipe, 8-in.	12,450 l. f.	.73	.77	1.35
6. Wye branches, 15x6-in.	16 ea.	3 00	4.50	5.00
7. Wye branches, 12x6-in.	60 ea.	6 00	3 25	3 75
8. Wye branches, 8x6-in.	345 ea.	3 00	1 85	2.10
9. Manholes, up to 7-ft. deep	44 ea.	100 00	100 00	105 00
10. Drop manholes, to 7-ft	5 ea.	140 00	135 00	120.00
11. Additional manhole depth over 7-ft.	150 ft.	10 00	10 00	9.00
12. Lampholes	6 ea.	35 00	40 00	30 00
13. Sewer crossing under tracks, A Street	Lump Sum	800.00	750.00	2,200.00
14. Sewer crossing under tracks, Hayes Street	Lump sum	1,000.00	2,100.00	4,000.00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You'll also find Flex-Beam an ideal guard rail for curves, high fills or wherever else it is needed to protect motorists. Write for complete data. Armco Drainage & Metal Products, Inc., and Associated Companies, 1765 Curtis St., Middletown, Ohio. Sheffield Steel Corp., Kansas City, Mo.

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BACK RIVER SEWAGE WORKS
BALTIMORE, MARYLAND

OWNER: City of Baltimore, Bureau of Sewers, Maryland. George E. Finck, sewerage engineer.

PROJECT: Construction of sludge tanks No. 4 and 5 for the Back River Sewage Works, Baltimore, Md. (Sanitary Contract No. 365). The two sludge digestion tanks are each 100-ft. in diameter, and each has a capacity of 200,600 cu.ft. Contract also provides for installation of three gas boilers in the present sludge control station, each with a capacity of 2,304,000 b.t.u. per hour. Work involves all necessary excavation, rolled embankment, timber and precast concrete piling, timber sheeting, concrete for structures, piping, valves, hydrants, electrical work, conduit for electrical work, and other appurtenant work required for completion of contract.

CONDITIONS: Contractor to furnish all materials and complete project in 300 calendar days. Rail, highway and water transportation facilities available to the city. Wage rates in Baltimore are: skilled labor, $1.4375 to $1.80 per hour; and common labor, 80c.

BIDS: Nine bids were received Sept. 13, 1945, ranging from the contract low of $531,136 to $740,479.

LIST OF BIDDERS:

1. Frank Angelozzi & Sons, Baltimore, Md. (contract) $531,136
2. Virginia Engineering Co., Inc., Newport News, Va. 534,753
3. The Tuller Constr. Co., Red Bank, N. J. 552,812
4. The Whiting-Turner Cont'g. Co., Baltimore, Md. 571,473
5. Square Constr. Co., Baltimore, Md. 599,512
6. Baltimore Contractors, Baltimore, Md. 613,074
7. The Baltimore Ship Ceiling Co., Baltimore, Md. 618,756
8. John L. Sullivan, Baltimore, Md. 670,271
9. McLean Contracting Co., Baltimore, Md. 740,479

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, except for sludge digestion tanks	14,600 c. y.	$2.50	$4.50	$6.00
2. Rolled embankment	12,500 c. y.	.60	.50	.50
3. Gravel refill, except for sludge digestion tanks	150 c. y.	6.00	8.00	4.00
4. Timber piles	15,000 l. f.	1.75	1.00	1.50
5. Precast concrete piles	1,600 l. f.	7.00	10.00	11.00
6. 12 x 12-in. timber sheeting	160 Mbm.	180.00	170.00	185.00
7. Class A concrete	260 c. y.	40.00	40.00	45.00
8. Class C concrete	130 c. y.	20.00	30.00	15.00
9. Reinforcing bars (except for precast conc. piling, manholes, inlets, electr. conduit manholes, sludge digestion tanks, meters, thermometers, boilers, etc.)	31,870 lb.	08	08	06
10. Struct. steel, except for sludge digest. tank	805 lb.	30	20	.20
11. Cast iron b. & s. pipe except for Items 32 and 33	240 ton	120.00	120.00	120.00
12. C. I. flanged pipe and standard fittings, except Items 32 and 33	20 ton	300.00	275.00	250.00
13. C. I. special castings	0.5 ton	400.00	700.00	350.00
14. 10-in. black steel pipe (except Items 32 and 33)	150 l. f.	12.00	10.00	8.00
15. 8-in. black steel pipe (except Items 32 and 33)	150 l. f.	10.00	9.00	7.00
16. 6-in. black steel pipe, except Items 32 and 33)	1,660 l. f.	6.00	5.00	4.75
17. 15-in. vitrified t. c. pipe	165 l. f.	6.00	3.00	2.00
18. 12-in. vitrified t. c. pipe	820 l. f.	1.50	2.00	1.50
19. 6-in. vitrified t. c. pipe	55 l. f.	1.00	1.00	.60
20. 6-in. ex. heavy soil pipe underdrain	590 l. f.	1.00	2.00	1.50
21. 6-in. vitrified t. c. pipe under drain	400 l. f.	1.00	.60	.50
22. Cinder fill	265 c. y.	3.00	4.00	3.00
23. Manholes and inlet (except Items 7 and 31)	65 l. f.	30.00	35.00	20.00
24. 10-in. gate valves, flanged ends, ext. stems	2 ea.	180.00	200.00	150.00
25. 10-in. gate valves, bell ends	5 ea.	145.00	140.00	100.00
26. 10-in. motor operated gate valves	2 ea.	1,400.00	650.00	400.00
27. 6-in. fire hydrant	1 ea.	150.00	120.00	150.00
28. Remove and relocate 6-in. fire hydrant	1 ea.	100.00	100.00	60.00
29. 6-duct tile electric conduit	1,610 duct. f.	.50	.50	.40
30. Single duct fibre electr. conduit	580 duct. f.	.50	.40	.50
31. Electric conduit manholes	Lump Sum	850.00	800.00	700.00
32. Sludge digestion tanks complete (2)	Lump Sum	301,291.00	288,000.00	286,000.00
33. Meters, thermometer, gas boilers, etc. in sludge cont. station	Lump Sum	39,550.00	31,000.00	29,000.00
34. Electrical work	Lump Sum	2,500.00	7,500.00	4,600.00
35. Removing masonry	1 c. y.	50.00	30.00	12.00
36. Cleaning up	Lump Sum	100.00	1,000.00	1,000.00

OUTFALL SEWER, CALIFORNIA

OWNER: City of South San Francisco, Calif.; Charles T. Broughton, works engineer.

PROJECT: Construction of outfall sewer, pump house, and force main in connection with South San Francisco, Calif. sanitary sewer project. Sewer discharges into deep water of bay and the work involves furnishing and placing 24-in., 27-in., 36-in., 42-in., and 48-in. diameter sewer pipe; sewage pumps and equipment; jacking corrugated steel casing under the Bayshore Highway; pile bents; concrete manholes, etc.

CONDITIONS: Contractor to furnish all materials and complete work in 180 days. Highway transportation facilities available to project site. Wage rates stipulated are: skilled labor, $1.50 per hour; semi-skilled, $1.2125; and common, 95c. Alternates were allowed for three types of pipe for force main: 24-in. reinforced concrete; 27-in. Hume process concrete pipe; 30-in. Hume process concrete pipe; 24-in., 27-in., or 30-in. wood stave pipe. Also alternate bids were asked on the corrugated steel casing, either 42-in. or 48-in. All bid prices are shown below, but the totals shown are for 24-in. reinforced concrete pipe and the 42-in. casing.

BIDS: Two bids were received June 4, 1945, the low of $130,439 and $135,529.

LIST OF BIDDERS:

1. McGuire & Hester, Oakland, Calif. (low bidder) $130,439
2. Peter Sorenson, Redwood City, Calif. 135,529

Item	Quan.	Unit Prices (1)	(2)
1. Vitr. clay pipe sanitary sewer, 24-in.	2,168 l. f.	$9.50	$8.00
2. Conc. manholes, complete with cast iron frames and covers, incl. 2 drop manholes	8 ea.	320.00	200.00
3. Crushed rock support for sewer	1,000 ton	2.00	5.00
4. Vitr. clay pipe sewer, 27-in.	1,737 l. f.	10.00	10.00
5. Vitr. clay pipe sewer, 36-in.	100 l. f.	13.75	12.00
6. 24-in. rein. conc. pipe force main	4,540 l. f.	8.00	11.00
7. 18-in. rein. conc. pipe force main, incl. 24x18-in. wye branch and two 18-in. tide gates	275 l. f.	8.50	9.00
8. 42-in. corr. steel casing jacked under Bayshore Highway	60 l. f.	75.00	100.00
9. 30-in. conc. pipe sewer with 30-in. tide gate	150 l. f.	10.00	15.00
10. Pile bents, complete	10 ea.	175.00	250.00
11. Control manhole, complete	1 ea.	1,250.00	350.00
12. Construct roadway to pumping plant, and fill pumping plant site	Lump Sum	3,750.00	2,000.00
13. Excavation for pump house and screen chamber	Lump Sum	8,000.00	900.00
14. Construction of Cl. A. concrete pump house and screen	180 c. y.	82.50	45.00
15. Sewage pumps, motors, electrical equipment, automatic bar screen, piping valves, fittings, control apparatus, wiring, lighting and incidental work to complete and equip pump house ready for operation	Lump Sum	11,500.00	18,000.00
16. Fencing pumping plant site, incl. 12-ft. gate (400 l. f.)	Lump Sum	780.00	600.00
Alternate Items			
6a. 27-in. Hume process conc. pipe in place of Item 6 above	4,540 .f.	8.85	11.00
6b. 30-in. Hume process conc. pipe in place of Item 6 above	4,540 l. f.	9.50	12.00
6c. 24-in. wood stave pipe in place of Item 6 above	4,540 l. f.	8.50	11.00
6d. 27-in. wood stave pipe in place of Item 6 above	4,540 l. f.	9.50	12.00
6e. 30-in. wood stave pipe in place of Item 6 above	4,540 l. f.	10.50	13.00
8a. 48-in. corr. steel casing jacked under Bayshore Highway in place of 42-in. casing in Item 8 above	60 Lf.	80.00	110.00

Photo Courtesy Rocky Mountain News, Denver, Colo.

A Picture
that speaks louder than words

A MAJOR break, in a 36" pipe line, floods a busy section of an important city, causing business to stop and an enormous financial loss.

To remove the possibility of great damage due to rupture of flow lines or force mains Rotovalves, arranged for Emergency Line Check Service, should be installed at strategic points such as: river crossings, flood areas or congested business and residential sections.

These valves will close automatically, in case excessive velocity exists in a pipe line, such as the rupture shown will cause.

As a double precaution, oil or water accumulator systems should be installed to prevent failure of the valve to operate, due to lack of water pressure.

Write for Rotovalves by Smith, Bulletin 140, and the suggestions of our Engineering Staff.

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POWER by SMITH

SUBSTRUCTURE FOR SEWAGE TREATMENT PLANT, NORFOLK, VIRGINIA

OWNER: Federal Works Agency, Washington, 25, D. C.; George C. Rothrock, Chief Engineer construction division; Aldrich and Buck, New York City, consulting engineers.

PROJECT: The construction of the substructure for a sewage treatment plant at the Army base at Norfolk, Virginia. The plant was designed for a flow of 11 million gallons per day and will include the construction of a filter building 105 x 77 ft., with a height of 23 ft., a sedimentation basin, 101 x 128 ft. and a depth of 12 ft.; two sludge digestor tanks, 80 ft. in diameter and 30 ft. high. The plant is to be located on filled ground and loose earth and therefore will be supported throughout by piles, necessitating the driving of some 101,000 linear feet of timber pilings. Another important item will be the placing of 5,500 cubic yards of class A concrete masonry.

CONDITIONS: Contractor to furnish all materials and to complete work in 365 consecutive calendar days. Rail and highway transportation facilities available. Wage rates are to be: $1.625 per hr. for skilled labor; $1.10 per hr. for semi-skilled; $.65 per hr. for common.

BIDS: Five bids were received on Oct. 2, 1945, ranging from the contract low of $543,650.00 to $693,955.00. The contract was awarded Oct. 23, 1945.

LIST OF BIDDERS:

1. E. & E. J. Pfotzer, Elkins Park, Penn. (contract) . $543,650.00
2. Reiss & Weinsier Inc., Brooklyn, N. Y. 556,415.00
3. Tidewater Construction Co., Norfolk, Va. 582,550.00
4. Carpenter Construction Co., Norfolk, Va. 631,378.00
5. Calnaught Contr. Corp., Portsmouth, Va. 693,955.00

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing sites and providing field office facilities	Lump Sum	7,000.00	8,000.00	10,920.00
2. Excavation and embankment				
a. Above elevation 0	24,000 cu. yd.	$3.00	$4.50	$3.12
b. Below elevation 0	7,000 cu. yd.	4.00	5.50	7.02
3. Sheeting left in place	20,000 f.b.m.*	50.00	130.00	85.00
4. Furnishing and driving timber pilings				
a. Untreated lengths between 30' and 40'	7,000 lin. ft.	1.00	.80	.60
b. Untreated lengths between 41' and 50'	54,000 lin. ft.	1.15	.88	.63
c. Untreated lengths between 51' and 60'	40,000 lin. ft.	1.25	.90	.61
d. Addl. price per lin. ft. for treating woodpiles	6,000 lin. ft.	.90	.60	.60
5. Class A concrete masonry	5,500 cu. yd.	40.00	36.00	43.87
6. Class B concrete masonry	100 cu. yd.	40.00	20.00	25.68
7. Portland cement added or omitted	100 bbls.	3.00	3.20	2.71
8. Steel reinforcement added or omitted	10,000 lbs.	.06	.08	.045
9. Brick masonry in manholes, fdns., etc.	30 cu. yd.	55.00	50.00	78.75
10. Furnish and install screening equipment	Lump Sum	13,000.00	16,400.00	20,850.00
11. Install equipment furnished by others	Lump Sum	11,000.00	11,000.00	15,010.00
12. Furn. and install inside piping and equipment	Lump Sum	16,000.00	16,000.00	27,270.00
13. Furn. and install misc. metal work	Lump Sum	8,400.00	20,000.00	16,607.00
14. Furn. and install outside gate valves and hydrants	Lump Sum	900.00	2,148.00	2,625.00
15. Furn. and laying outside cast iron piping				
a. 4 in. diameter	800 lin. ft.	2.00	1.36	1.48
b. 6 in. and 8 in. diameter	1,200 lin. ft.	3.00	2.26	2.35
c. 30 in. diameter	110 lin. ft.	18.00	18.88	20.37
16. Furn. and laying outside wrought iron and steel piping				
a. 2 in. diameter and smaller	200 lin. ft.	1.00	1.50	1.00
b. 6 in. and 8 in. dia. steel with dresser couplings	800 lin. ft.	4.00	2.55	4.67
17. Furn. & laying reinf. cover and vitrified tile sewers				
a. 4 in. diam. v. t.	150 lin. ft.	.80	.70	1.26
b. 6 in. & 8 in. diam. v. t.	700 lin. ft.	1.00	1.26	1.60
c. 10 in. and 12 in. diam. v. t.	300 lin. ft.	1.50	1.55	3.18
d. 21 in. and 24 in. diam. reinf. concrete culvert pipe	900 lin. ft.	4.00	4.24	7.88
e. 48 in. diam. reinf. concrete sewerpipe	150 lin. ft.	12.00	14.66	18.64
f. 54 in. diam. reinf. concrete sewerpipe	200 lin. ft.	16.00	15.00	23.42
18. Timber foundation	5,000 f.b.m.	.10	.15	.158
19. Gravel foundation	200 cu. yd.	5.00	9.00	6.00
20. Bituminous roadways and paths				
a. Roadways	5,000 sq. yd.	2.00	2.50	3.47
b. Paths	200 sq. yd.	2.00	1.80	2.63
21. Misc. work in sludge control chamber and elsewhere	Lump Sum	3,980.00	4,335.00	3,710.00

WALL AND APPURTENANT WORKS, MILL CREEK, CINCINNATI, OHIO

OWNER: U. S. Engineer, Cincinnati, Ohio; Col. Peschal N. Strong, engineer.

PROJECT: Reinforced concrete wall and embankment, constructing unit 4, Mill Creek Barrier Dam, completing west end connection between dam and high grounds. Concrete and line type construction. Work is at Mill Creek, near 8th Street, Cincinnati, Ohio. Overall length to be 1,500 feet with a height of 20 feet.

CONDITIONS: Contractor to furnish all form materials—no materials are to be furnished by the owner. Transportation facilities are readily available by rail, highway and water to the site. Wage rates are reported to be $1.82½ per hour for skilled labor; $1.50 per hour for semi-skilled; $.90 per hour for common. As the location of this Wall is very close to the Ohio River, rises in the Ohio and its resulting backwater presents a hazard that may affect total cost. The stipulated contract time was set at June 30, 1946.

BIDS: Three bids were received Aug. 14, 1945 ranging from the contract low of $199,689 to $295,804.

LIST OF BIDDERS:

1. Foley Construction Co., Cincinnati, Ohio $199,689
2. LaCrosse Dredging Co., Cincinnati, Ohio 211,351
3. Visintine & Assoc., Chicago, Ill. 295,804

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing, grubbing and removal of surface structures	1 job	$1,000.00	$1,000.00	$1,000.00
2. Preparation of embankment foundations	22,100 cu. yd.	.90	.80	.80
3. Structure excavation	5,900 cu. yd.	3.00	5.00	6.00
4. Excavation in borrow areas	38,350 cu. yd.	.80	.80	1.00
5. Embankment	43,850 cu. yd.	.60	.36	.90
6. Additional compaction	1,000 squares	.50	.01	.25
7. Seeding	1.2 acre	100.00	100.00	400.00
8. Compacted backfill	4,300 cu. yd.	3.00	2.00	5.00
9. Sand and gravel filters	1,050 cu. yd.	3.00	3.50	4.00
10. Six Inch (6") collector drain	965 lin. ft.	1.50	1.00	1.50
11. Twelve Inch (12") pipe drain	350 lin. ft.	2.50	1.50	1.85
12. Copper waterstops and flashing	900 pound	.70	1.00	1.00
13. Catch basin	1 each	50.00	75.00	150.00
14. Manhole No. 1	1 each	150.00	150.00	175.00
15. Manhole No. 2	1 each	200.00	200.00	175.00
16. Manhole No. 3	1 each	220.00	200.00	175.00
17. Dumped riprap	960 cu. yd.	7.00	7.00	8.00
18. Paved gutters	90 sq. yd.	8.00	3.00	4.00
19. Hand placed riprap	60 sq. yd.	7.50	2.50	4.00
20. Cement	2,150 bbls.	2.50	2.50	2.00
21. Concrete	1,710 cu. yd.	23.00	33.00	43.00
22. Reinforcement	188,300 pound	.07	.07	.05
23. Gate storage house No. 1 superstructure complete (except door and frame)	1 job	2,000.00	600.00	2,800.00
24. Gate storage house No. 2 superstructure complete (except door and frame and miscellaneous metal)	1 job	1,200.00	350.00	1,400.00
25. Gate storage house doors and frames	3 each	200.00	150.00	200.00
26. Louvers	5 each	30.00	25.00	25.00
27. Road surfacing	125 sq. yd.	1.00	1.00	2.50
28. Guard posts	40 each	4.00	7.50	5.00
29. Split column closures	1 job	500.00	300.00	800.00
30. Fox dowels and expansion shields	1 job	1,500.00	800.00	600.00
31. Miscellaneous metal	21,530 pound	.20	.30	.40
32. Gate closures—gate 1A	1 job	3,000.00	5,000.00	10,000.00
33. Gate closures—gate 1B	1 job	1,500.00	1,100.00	3,010.00
34. Gate closures—gate No. 2	1 job	2,250.00	2,750.00	4,000.00

LIMA shovels, cranes, draglines, clamshells and pull-shovels are built to match the job. They are easily converted in the field, from one combination to another without a lot of extra work. This advantage makes it possible to handle many different kinds of excavating and crane work with one machine. You simply change front end equipment to match the job to be done. When you make your next equipment purchase, consider the wide range of application afforded by LIMA and assure yourself of the greater profits that come with an all-purpose machine. Other LIMA advantages are: independent clutches, anti-friction bearings at every important bearing point, fast, mobile crawlers, and air control on the larger types. A LIMA is identified by the diamond on the cab, an emblem of quality for 75 years.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division — **LIMA, OHIO**

NEW YORK, N. Y. · ST. LOUIS, MO. · DALLAS, TEXAS · SEATTLE, WASH.
NEWARK, N. J. · MINNEAPOLIS, MINN. · MEMPHIS, TENN. · SPOKANE, WASH.
LOS ANGELES, CALIF. · SAN FRANCISCO, CALIF. · PORTLAND, OREGON

CANALS AND LATERALS, MISSOULA VALLEY PROJECT, MONTANA

OWNER: Bureau of Reclamation, Hamilton, Mont.

PROJECT: Construction of earthwork and structures, Big Flat canal and laterals L and S, Big Flat unit, Missoula Valley project, Montana. Project is situated near Missoula, Mont. Work to be performed includes, as part of headworks for canal, the construction of a precast concrete pipe siphon under the tracks of the Northern Pacific Railroad. Pipe to be installed by the jacking method.

CONDITIONS: Contractor to furnish sand and coarse aggregate; form materials spikes and nails under twenty-penny in size; wire and wire ties for holding reinforcement bars; all temporary supports; water; embankment and backfill materials; rock and rock spalls; sealing compound for coating joints; and all other materials not part of completed structure, but required for completion of the work. Government to furnish balance of materials, including cement, reinforcement bars, precast concrete pipe, lumber for permanent installation, gates and gate hoists, and miscellaneous metalwork. Time for completion is 180 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.00 to $1.50 per hour; semi-skilled, 95c. to $1.25; and common, 75c. to 90c.

BIDS: Seven bids were received May 15, 1945, ranging from the contract low of $129,952 to $192,241.

LIST OF BIDDERS: (Schedules 1 and 2 combined).

1. Otis Williams & Co., Helena, Mont. (contract) $129,952
2. Nilson, Smith Constr. Co., Great Falls, Mont. 130,330
3. Robertson & Cave, Great Falls, Mont. 136,697
4. Barnard Curtis Co., Minneapolis, Minn. 142,023
5. Peter Kiewit Sons' Co., Sheridan, Wyo. 180,978
6. Union Construction Co., Great Falls, Mont. 185,116
7. James Constr. Co., Seattle, Wash. 192,241

Schedule No. 1

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing between Sta. 98 and 148	3.5 ac.	$85.00	$175.00	$60.00
2. Clearing between Sta. 212 and 308	18.7 ac.	85.00	175.00	60.00
3. Grubbing between Sta. 98 and 148	3.5 ac.	85.00	175.00	23.65
4. Grubbing between Sta. 212 and 308	18.7 ac.	85.00	80.00	23.65
5. Excavation, common, for canal	100,700 c. y.	.30	.23	.2875
6. Excavation, rock, for canal	5,300 c. y.	1.50	.75	1.45
7. Overhaul	10,000 sta. c. y.	.05	.06	.0233
8. Compacting embankments	2,000 c. y.	.40	.40	.23
9. Excav., common, drng. channels and dikes	1,000 c. y.	.30	.50	.29
10. Excav., rock, drng. channels and dikes	100 c. y.	.30	1.50	1.45
11. Earth lining of canal	1,300 c. y.	.30	.50	.46
12. Excav., common, for structures	12,000 c. y.	.75	.75	.80
13. Excav., rock, for structures	1,000 c. y.	2.50	1.00	1.45
14. Backfill	5,500 c. y.	.25	.20	.29
15. Compacting backfill	2,300 c. y.	.50	.75	1.10
16. Concrete in structures	1,200 c. y.	30.00	35.00	37.00
17. Placing reinforcement bars	125,000 lb.	.04	.05	.0475
18. Dry-rock paving	200 s. y	3.00	4.00	4.73
19. Erecting timber in structures	23 M bm.	40.00	70.00	56.79
20. Place elastic joint filler mat'l	9 s. f.	1.00	2.00	1.44
21. Place metal water stops in joints	320 lb.	.10	.20	.36
22. Lay 18-in. concrete pipe	12 l. f.	1.00	1.50	1.38
23. Lay 24-in. concrete pipe	256 l. f.	1.50	1.60	1.90
24. Lay 48-in. concrete pipe	98 l. f.	2.25	6.00	8.97
25. Jacking 48-in. conc. pipe under R.R.	42 l. f.	20.00	15.00	27.74
26. Install gates and gate hoists	2,600 lb.	.10	.20	.12
27. Install misc. metalwork	5,000 lb.	.10	.20	.18

Schedule No. 2

28. Excavation, common, for canal	30,000 c. y.	.30	.25	.23
29. Excavation, rock, for canal	100 c. y.	1.00	1.50	1.45
30. Overhaul	15,000 sta. c.y.	.05	.06	.0233
31. Compacting embankments	13,500 c. y.	.40	.40	.23
32. Excav., common, drng. channels and dikes	300 c. y.	.30	.50	.29
33. Excav., rock, drng. channels and dikes	10 c. y.	.30	2.00	1.45
34. Earth lining of canal	1,100 c. y.	.30	.40	.46
35. Excavation, common, for structures	650 c. y.	1.00	.75	.80
36. Excavation, rock, structures	10 c. y.	1.00	2.00	1.45
37. Backfill	1,000 c. y.	.25	.20	.29
38. Compacting backfill	600 c. y.	.50	.75	1.10
39. Concrete in structures	210 c. y.	35.00	35.00	38.70
40. Place reinforcement bars	17,000 lb.	.04	.05	.04
41. Dry-rock paving	340 s. y.	3.00	4.00	4.73
42. Erecting timber in structures	1 M bm.	40.00	70.00	56.7957
43. Lay 15-in. concrete pipe	70 l. f.	1.00	1.50	1.38
44. Lay 18-in. concrete pipe	153 l. f.	1.00	1.50	1.38
45. Lay 30-in. concrete pipe	54 l. f.	1.50	3.00	1.73
46. Lay 36-in. concrete pipe	56 l. f.	1.50	4.00	1.84
47. Lay 42-in. concrete pipe	32 l. f.	2.00	5.00	2.30
48. Installing gates	5,500 lb.	.10	.20	.12
49. Install miscellaneous metalwork	2,200 lb.	.10	.20	.18

WASTEWAY, COACHELLA CANAL CALIFORNIA

OWNER: U. S. Bureau of Reclamation, Yuma, Ariz.; John K. Rohrer, acting construction engineer.

PROJECT: Earthwork, concrete lining and structures for Wasteway No. 1 (Sta. 3 + 96.5 to Sta. 176 + 83) running from Sta. 4782 + 01.6 of the Coachella Canal to the Salton Sea. Work is located 20 miles southeast of Indio, Calif. Structures to be built include bearing piles for bridge abutments, railroad bridge and highway bridge, in addition to the wasteway-channel lining and the wasteway outlet structure.

CONDITIONS: Contractor to furnish all form materials; spikes and nails; wire and wire ties; temporary supports; water; sealing compounds; embankment and backfill materials; rock and rock spalls; gravel and crushed rock; welding rods; and all other materials not part of completed structure, but required for completion of work. Time for completion 240 calendar days. Rail and highway transportation facilities available near site of work. Employment of prisoners of war, enemy aliens and Japanese-born Americans may be utilized if approved by proper federal agencies having control. Wage rates specified are: skilled labor, $1.35 to $1.75 per hour; semi-skilled, 95c. to $1.40; and common labor, 95c. per hour.

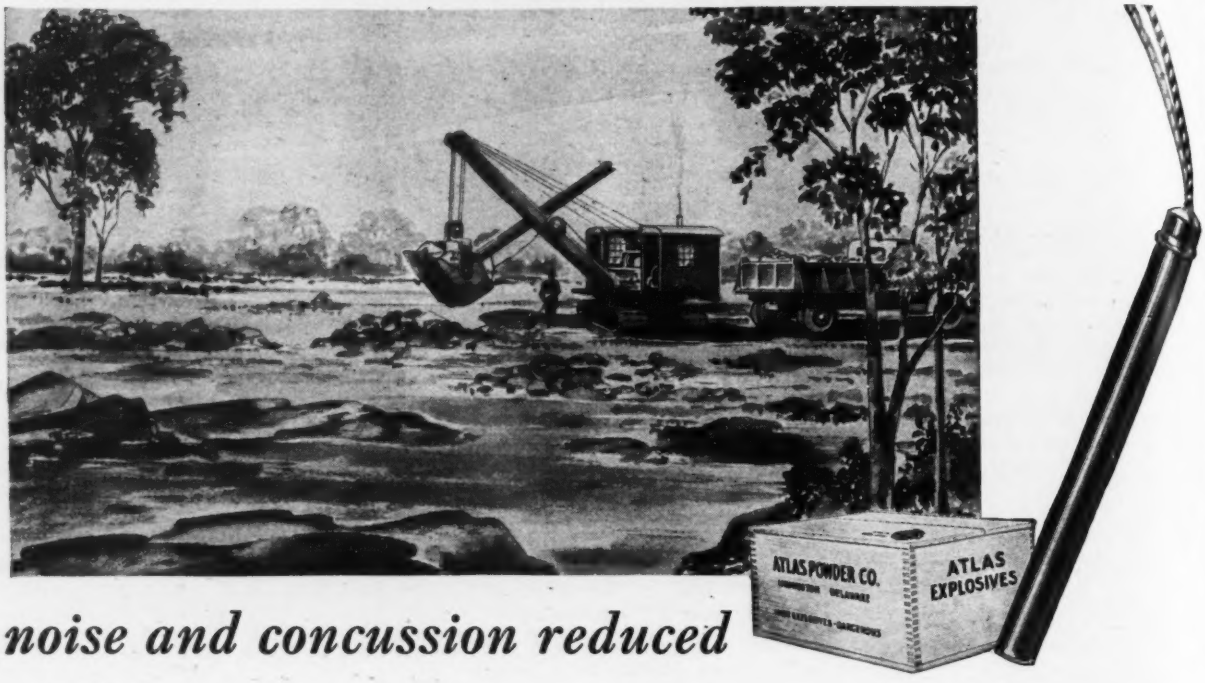
BIDS: Five bids were received August 15, 1945, and three more were received after the bid opening as a result of the unofficial V-J Day holiday delay in mail deliveries. The eight bids ranged from the low of $298,472 to $441,149.

LIST OF BIDDERS:

1. Ralph A. Bell, Monrovia, Calif. (low bidder) $298,472
2. Fisher Contracting Co., Phoenix, Ariz. 320,904
3. E. B. Bishop, Orland, Calif. 322,375
4. Guerin Bros., South San Francisco, Calif. 346,369
5. M. H. Hasler, Santa Ana, Calif. 357,672
6. Charles J. Dorfman, Los Angeles, Calif. 369,410
7. Spencer Webb and Frank T. Hickey, Los Angeles, Calif. 392,840
8. W. E. Kier Constr. Co., Hollywood, Calif, and Bressi-Bevanda Constructors, Inc., Los Angeles, Calif. 441,149

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation for wasteway channel	155,000 c. y.	$0.33	$0.34	$0.26
2. Excav. for temporary RR relocation	2,400 c. y.	.40	.39	.20
3. Excavation for structures	1,400 c. y.	1.50	1.40	.75
4. Compacting embankments	250 c. y.	1.50	2.00	.50
5. Compacting sub-base	100 c. y.	1.50	.75	1.00
6. Trimming foundations for concrete wasteway lining	87,500 s. y.	.33	.68	.47
7. Backfill about wasteway-channel side walls	9,000 c. y.	.40	.46	.15
8. Backfill about structures	4,140 sta. c. y.	.40	.65	.25
9. Compacting backfill	1,140 c. y.	1.75	.78	1.00
10. Rockfill	900 c. y.	5.00	3.90	6.00
11. Conc. in wasteway-channel lining	9,700 c. y.	15.50	13.90	18.00
12. Conc. in wasteway outlet struct.	272 c. y.	34.00	33.20	35.00
13. Concrete in highway bridge	157 c. y.	34.00	70.00	35.00
14. Concrete in railroad bridge	176 c. y.	34.00	37.10	35.00
15. Place reinforcement bars	606,000 lb.	.08	.03	.03
16. Place elastic filler material in joints	37 s. f.	2.00	1.30	1.00
17. Place rubber water stops in joints	50 l. f.	2.00	1.00	1.00
18. Manufacture and drive 30-ft. conc. piles	16 ea.	a187.00	410.00	180.00
19. Manufacture and drive 45-ft. conc. piles	37 ea.	280.00	440.00	230.00
20. Drive struct. steel bearing piles	2,450 l. f.	1.80	2.36	2.15
21. Erect structural steel	52,000 lb.	.04	.02	.02
22. Install miscellaneous metalwork	1,900 lb.	.30	.38	.30
23. Erect timber in structures	1.5 M bm.	100.00	300.00	100.00

Never such breakage as with
ATLAS ROCKMASTERS



noise and concussion reduced

FIG. A—Alternate holes are loaded with "A" Rockmasters and with "B" Rockmasters.

FIG. B—Detonation of "A" Rockmasters places rock under tremendous tension—*almost* to the breaking point.

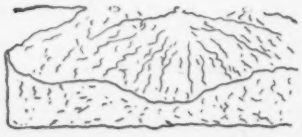


FIG. C—Split-seconds later, the "B" Rockmaster completes the job—*thoroughly* shatters the rock.

Unusual rock formation caused a lot of breakage trouble on a recent airport job.

The formation consisted of a layer of hard rock, some three or four feet thick, under which was softer rock. To obtain the required grading, bore holes had to be put down into this lower strata. When the blast was set off, however, large slabs of stone were turned up that had to be redrilled and blasted.

The problem was solved by a system of controlled time blasts—the basic principle of the Atlas Rockmaster Blasting System. Instead of detonating the charge all at once, a series of delayed impulses was set up. Instantly fragmentation was improved. That's what the Atlas Rockmaster does in nine blasting jobs out of ten. It gives much better breakage. Moreover, noise and concussion are drastically cut down and back break is also reduced.

Can Atlas Rockmaster improve operations for you, too? With your knowledge of the job, and our knowledge of explosives, the answer is probably yes. Let the Atlas representative show you how the Rockmaster works. Remember that it also gives you

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EARTHWORK, CONCRETE LINING, ETC., RATHDRUM PRAIRIE PROJECT, IDAHO

OWNER: Bureau of Reclamation, Coeur d'Alene, Idaho.

PROJECT: Earthwork, concrete lining, pipelines, and structures for canal and lateral system, Post Falls Unit, Rathdrum Prairie Irrigation Project, located near Coeur d'Alene, Idaho. Includes all necessary excavation for canal and structures; compacting embankments; compacted earth lining of canal; gravel blanket in canal; concrete in structures; concrete in canal lining; removing, salvaging and re-erecting 24-in. wood-stave pipe; pedestals for wood-stave pipe; laying concrete pipe; installing gates and miscellaneous metalwork; and furnishing, constructing and removing temporary construction at railroad crossing. (Spec. No. 1094).

CONDITIONS: Government to furnish cement; reinforcement bars; precast concrete pipe; staves, pedestals, etc., for wood-stave pipe; steel pipe connections; pipe fittings and valves; weep pipes; gates, weir crests, etc., for turnouts, checks, weirs and delivery boxes; lumber for permanent installation; bolts, washers, etc.; paint and coating materials. Contractor to furnish all other materials, including that which is necessary to complete work but not part of completed structure, such as form materials and temporary supports. Time for completion: work on Main canal to Station 90, and all work on lateral 8.8 within 60 calendar days; all remaining work on Schedule 1 in 150 calendar days; and all work on Schedule 2 within 240 calendar days. Priority rating AA-3. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.20 to $1.75 per hour; semi-skilled, 95c. to $1.25; and common, $1.00.

BIDS: Six bids were opened March 30, 1945, ranging from the low of $111,395 to $203,319.

LIST OF BIDDERS: (Combination of Schedules 1 and 2).

1. Northwestern Engineering Co., Rapid City, S. Dak. (low bidder) $111,395
2. Sather & Sons, Spokane, Wash. 147,738
3. Charles A. Power, Spokane, Wash. 153,865
4. Roy L. Bair, Spokane, Wash. 166,153
5. Henry L. Horn, Caldwell, Idaho 190,293
6. W. C. Smith Co., Portland, Ore. 203,319

Schedule No. 1

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, common, for canal	35,000 c. y.	$0.20	$0.28	$0.42
2. Excavation, rock, for canal	100 c. y.	2.20	1.60	2.50
3. Overhaul (station cu. yd.)	2,000 c. y.	.05	.03	.03
4. Compacting embankments	10,000 c. y.	.15	.30	.35
5. Compacted earth lining of canal	5,600 c. y.	1.20	2.00	2.00
6. Gravel blanket in canal	5,400 c. y.	.75	1.35	1.30
7. Excav., common, for pipe trench on lateral 6.7–2.4	8,000 c. y.	.40	.60	.40
8. Excav., rock, for pipe trench on lateral 6.7–2.4	100 c. y.	4.00	2.00	2.50
9. Backfill of pipe trench on lateral 6.7–2.4	8,000 c. y.	.52	.30	.20
0. Trimming earth found'n. for conc. lining	3,000 s. y.	.60	1.00	.20
11. Excavation, common, for structures	600 c. y.	1.20	2.00	1.50
12. Excavation, rock, for structures	10 c. y.	4.00	5.00	3.00
13. Backfill	400 c. y.	.90	.40	.40
14. Compacting backfill	300 c. y.	1.10	.75	1.00
15. Concrete in structures	130 c. y.	45.00	50.00	45.00
16. Concrete in canal lining	315 c. y.	22.50	30.00	27.00
17. Placing reinforcement bars	28,000 lb.	.045	.04	.05
18. Dry-rock paving	100 s. y.	3.00	4.00	3.00
19. Erecting timber in structures	2 Mbm.	100.00	50.00	60.00
20. Remove and salvage exist. 24-in. wood-stave pipe	815 l. f.	.54	.50	.40
21. Erect 24-in. wood-stave pipe	500 l. f.	1.00	1.75	1.50
22. Cut and slot ends of staves	100 ends	.20	.25	.30
23. Place pedestals for 24-in. wood-stave pipe	50 ea.	1.00	3.00	4.00
24. Lay 4-in. concrete pipe	10 l. f.	.37	.30	.30
25. Lay 6-in. concrete pipe	60 l. f.	.45	.40	.40
26. Lay 8-in. concrete pipe	10 l. f.	.60	.60	.50
27. Lay 10-in. concrete pipe	10 l. f.	.75	.75	.65
28. Lay 12-in. concrete pipe	20 l. f.	.75	.90	.80
29. Lay 15-in. concrete pipe	210 l. f.	.75	1.10	1.00
30. Lay 18-in. concrete pipe	5,100 l. f.	.80	1.20	1.00
31. Lay 21-in. concrete pipe	9,300 l. f.	1.00	1.40	1.20
32. Lay 24-in. concrete pipe	3,050 l. f.	1.10	1.60	1.40
33. Lay 27-in. concrete pipe	6,000 l. f.	1.80	1.75	1.45
34. Lay 30-in. concrete pipe	16 l. f.	3.00	1.90	2.00
35. Install gates and misc. metal work	1,000 lb.	.12	.15	.10

Schedule No. 2

36. Excavation, common, for canal	70,000 c. y.	$0.10	$0.25	$0.40
37. Excavation, rock, for canal	100 c. y.	2.00	1.60	3.00
38. Overhaul (station cu. yd.)	16,000 c. y.	.05	.03	.03
39. Compacting embankments	35,000 c. y.	.15	.30	.35
40. Compacted earth lining of canal	1,300 c. y.	1.20	2.50	2.00
41. Gravel blanket in canal	1,100 c. y.	.75	1.50	1.30
42. Excav., common, for structures	2,500 c. y.	1.20	1.00	1.50
43. Excav., rock, for structures	10 c. y.	4.00	3.00	3.00
44. Backfill	1,200 c. y.	.90	.40	.40
45. Compacting backfill	1,000 c. y.	1.10	.75	1.00
46. Concrete in structures	190 c. y.	45.00	48.00	45.00
47. Placing reinforcement bars	15,000 lb.	.045	.04	.05
48. Dry-rock paving	300 s. y.	3.00	4.00	3.00
49. Erecting timber in structures	7 Mbm.	100.00	50.00	60.00
50. Erect 42-in. wood-stave pipe	4,500 l.f.	1.30	1.75	1.80
51. Cut and slot ends of staves	500 ends	.20	.50	.30
52. Place pedestals for wood-stave pipe	455 ea.	2.50	3.00	4.00
53. Lay 10-in. concrete pipe	12 l. f.	.75	.75	.75
54. Lay 15-in. concrete pipe	455 l. f.	.80	1.10	1.00
55. Lay 18-in. concrete pipe	216 l. f.	1.00	1.20	1.10
56. Lay 24-in. concrete pipe	102 l. f.	1.10	1.60	1.50
57. Lay 27-in. concrete pipe	80 l. f.	1.20	1.75	1.70
58. Lay 30-in. concrete pipe	156 l. f.	3.00	1.90	2.00
59. Lay 42-in. concrete pipe	40 l. f.	4.00	2.80	2.50
60. Install gates and misc. metal work	10,000 lb.	.12	.15	.10
61. Furnishing, constructing and removing temporary construction at railroad crossing	Lump Sum	400.00	250.00	2,000.0

EARTHWORK AND STRUCTURES DESCHUTES PROJECT, OREGON

OWNER: Bureau of Reclamation, Bend, Ore.; F. M. Spencer, acting construction engineer.

PROJECT: Construction of Lateral M-43 and sublaterals, including all earthwork and structures, Deschutes project, Oregon. Work is located approximately 32 to 38 miles north of Bend, Ore. Structures will include checks, chutes, drops, siphons, weirs, turnouts, bridges, culverts and division boxes and are located at various points along the laterals. Earthwork includes rock and common excavation for laterals and structures, overhaul, compacting embankments, backfill, and compacting of backfill.

CONDITIONS: Government will furnish cement, sand and coarse aggregate for concrete; gravel; concrete pipe; metal pipe for weep pipes; pipes and fittings for handrail, and for air vents and drains; lumber for permanent installation; metalwork and gates, etc. for laterals. Contractor to furnish balance of material and complete work in 200 calendar days. Hiring must be done through local USES office to insure that no workers will be taken from lumbering, agriculture or other construction or production jobs which have higher priority rating. Employment of prisoners of war or enemy aliens may be utilized if approved by proper federal agencies having control. Wage rates specified are: skilled labor, $1.375 to $1,85 per hour; semi-skilled, 95c. to $1.25; and common, 95c.

BIDS: Two bids were received August 2, 1945, the low of $245,291, and $299,855.

LIST OF BIDDERS:

1. W. C. Thompson, San Francisco, Calif. (low bidder) $245,291
2. E. B. Bishop, Orland, Calif. 299,855

Item	Quan.	Unit Prices (1)	(2)
1. Excavation, common, for laterals	145,000 c. y.	$0.38	$0.50
2. Excavation, rock, for laterals	1,000 c. y.	2.75	.50
3. Overhaul	7,000 sta. c. y.	.05	.05
4. Compacting embankments	1,400 c. y.	.40	.50
5. Excavation, common, for structures	16,000 c. y.	.90	1.00
6. Excavation, rock, for structures	250 c. y.	4.00	1.00
7. Backfill	11,500 c. y.	.40	.50
8. Compacting backfill	6,000 c. y.	1.00	1.00
9. Concrete in structures	3,550 c. y.	37.50	46.00
10. Placing reinforcement bars	264,000 lb.	.04	.055
11. Dry-rock paving	400 s. y.	5.00	4.00
12. Erecting timber in structures	73 M bm.	65.00	75.00
13. Lay 18-in. concrete pipe	2,460 l. f.	1.30	2.00
14. Lay 24-in. concrete pipe	730 l. f.	1.75	2.00
15. Lay 30-in. concrete pipe	240 l. f.	2.25	2.50
16. Lay 36-in. concrete pipe	45 l. f.	3.00	4.00
17. Install gates and misc. metalwork	33,000 lb.	.15	.15

In the *Higher Efficiency* Brackets...

The smoothness and evenness with which water flows through your pump has a lot to do with pumping costs. In Gardner-Denver centrifugals, rigidly controlled foundry practices assure absolutely smooth water passages. Furthermore, these passages are properly proportioned to eliminate unnecessary eddies, back-waters and sudden changes in velocity. This—plus the inclusion of every other worthwhile hydraulic and mechanical feature—is why Gardner-Denver centrifugals are in the higher efficiency brackets. For complete information, write Gardner-Denver Company, Quincy, Illinois.

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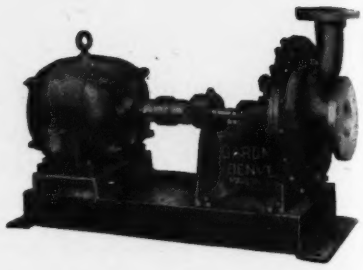
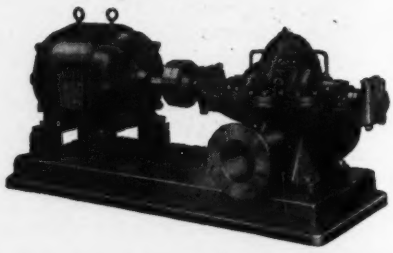
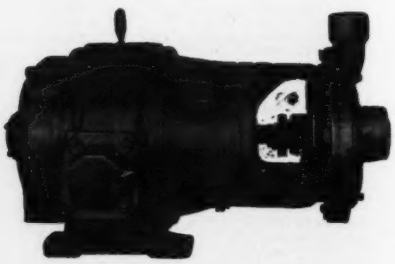


Side Suction. *Designed for general service, these Gardner-Denver Side Suction Pumps are low in first cost, as well as in installation costs. Capacities up to 2.3 million gallons per day, or 1600 gallons per minute, can be handled in heads up to 100 feet.*



Double Suction. *Gardner-Denver Double Suction Single-Stage Centrifugal Pumps cover all heads up to 300 feet. These pumps have a horizontally split case for easy accessibility. Wearing rings are easily checked. The entire rotor assembly can be removed without disturbing the motor or piping, or exposing the bearings.*



Close Coupled. *In these Gardner-Denver Centrifugals, pump and motor are combined to form a complete, compact unit. Pumps can be installed in any position—on floor, wall or ceiling. These centrifugals are designed for capacities up to 250 gallons per minute, and heads up to 250 feet.*

EARTHWORK AND STRUCTURES TUCUMCARI PROJECT, NEW MEXICO

OWNER: U. S. Bureau of Reclamation, Tucumcari Project, Tucumcari, N. Mex.

PROJECTS: Turnouts, checks, weirs, culverts, drops and chutes for Bell, Elliott, Roberts, State, Jack County, Liberty, Young, Coulter, Hurley and Bend laterals and sublaterals, for Conchas Canal, Tucumcari project, New Mexico. Site of work from two to four miles northwest of Tucumcari, N. M.

CONDITIONS: Government to furnish cement, sand coarse aggregate; reinforcement bars; precast-concrete pipe; metalwork for stop-plank guides; weep pipes; metal weir crests; metal gages; lumber for permanent installation; gates; paint materials; anchor bolts; bolts, washers, screws, spikes and large nails; and all other materials that are to become part of the finished structures. Rail and highway transportation facilities available. Time for completion: 100 calendar days. Preference rating AA-3. Wage rates specified as minimums are: skilled labor, $1.25 to $1.50 per hour; semi-skilled, 60c. to $1.00; and common, 60c.

BIDS: Two bids were received February 12, 1945, the low of $130,041, and $159,168.

LIST OF BIDDERS:

1. Lym Engineering Co., Salt Lake City, Utah (low bidder) $130,041
2. Robert E. Ziebarth, Long Beach, Calif. 159,168

Item	Quan.	Unit Prices (1)	(2)
1. Excavation for structures	4,800 c. y.	$1.20	$1.66
2. Backfill	11,400 c. y.	.35	.93
3. Compacting backfill	6,000 c. y.	1.80	.81
4. Concrete in structures	2,150 c. y.	40.00	47.00
5. Place reinforcement bars	205,000 lb.	.036	.061
6. Dry-rock paving	2,580 s. y.	3.63	5.45
7. Erecting timber in structures	5 Mbm.	96.80	115.00
8. Lay 15-in. concrete pipe	3,240 l. f.	.97	.50
9. Lay 18-in. concrete pipe	36 l. f.	1.06	1.80
10. Lay 21-in. concrete pipe	36 l. f.	1.21	2.10
11. Lay 24-in. concrete pipe	596 l. f.	1.35	2.30
12. Lay 30-in. concrete pipe	72 l. f.	1.45	8.00
13. Lay 36-in. concrete pipe	108 l. f.	1.93	8.50
14. Install gates and miscellaneous metalwork	48,000 lb.	.04	.049

EARTHWORK AND STRUCTURES MIRAGE FLATS PROJECT, NEBRASKA

OWNER: Bureau of Reclamation, Hemingford, Nebr.

PROJECT: Construction of earthwork and structures from Station 0 / 00 to Station 555 / 00, laterals and sub-laterals, Mirage Flats project, Nebr. Site is 23 to 27 miles northeast of Hemingford, Nebraska. Earthwork includes clearing, grubbing; excavations for structures, channels and dikes; construction and compaction of embankments and backfills; dry rock paving. Structures include timber, concrete pipe, gates. Cement work includes mixing, forming, placing, finishing and curing.

CONDITIONS: Government to furnish cement, concrete pipe, gates, metal weir crests and gages, lumber for permanent installations, anchor bolts, bolts, washers, spikes, nails, paints and preservatives. Contractor to furnish all sand and coarse aggregates for concrete, all form materials, and the hauling of all materials, including those delivered to contractor by Government. Work to be completed in 180 calendar days. Wage rates specified by Secretary of Labor as minimums are: $1.25 to $1.50 for skilled labor per hour, 75¢ to $1.25 for semi-skilled and 70¢ for common. A 40-hour workweek is a requirement on site.

BIDS: Four bids were received at Hemingford, Nebr. on Oct. 19, 1945, ranging from the contract low of $81,362 to $162,655.

LIST OF BIDDERS:

1. Trione Contracting Co., Denver, Colo. $81,363
2. Malcolm G. Long, Billings, Mont. 85,713
3. Roush Construction Co., Crawford, Neb. 90,812
4. Steinwald and Watts, Denver, Colo. 162,655

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation for laterals	105,000 c. y.	$0.28	$0.30	$0.28
2. Overhaul	40,000 sta. c. y.	.02	.02	.02
3. Compacting embankment	5,000 c. y.	.30	.40	.50
4. Excavation for structures	5,000 c. y.	1.50	2.00	1.65
5. Backfill	3,000 c. y.	.40	.33	.35
6. Compacting backfill	1,600 c. y.	1.25	1.00	1.00
7. Dry rock paving	450 s. y.	4.00	5.00	5.50
8. Concrete in structures	615 c. y.	48.00	47.50	55.00
9. Placing reinforcement bars	50,000 lbs.	.05	.04	.05
10. Erecting timber in structures	13 Mbm.	75.00	75.00	100.00
11. Laying 18 in. dia. concrete pipe	650 l. f.	1.25	1.50	2.00
12. Laying 24 in. dia. concrete pipe	420 l. f.	1.75	2.00	2.60
13. Laying 30 in. dia. concrete pipe	380 l. f.	2.50	2.50	3.25
14. Laying 36 in. dia. concrete pipe	120 l. f.	3.50	3.00	3.75
15. Installing gates and misc. metalwork	13,000 lbs.	.10	.10	.20

CONSTRUCTION OF CHECK STRUCTURE ALL-AMERICAN CANAL

OWNER: Bureau of Reclamation—All-American Canal System, Boulder Canyon project, J. K. Rohrer, construction engineer.

PROJECT: Construction of a check structure at Station 48 + 50 of the All-American Canal, Boulder Canyon project, Arizona-California-Nevada. Site is 12 miles north of Yuma, Ariz.

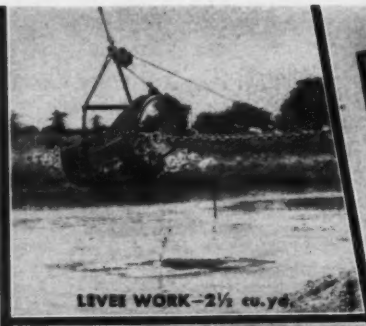
CONDITIONS: Owner to furnish majority of materials. Contractor shall haul and handle all materials on site; supply all form materials, riprap and backfill materials. All concrete placed under the supervision of a Government Inspector. Time for completion is 120 calendar days. Wage rates specified as minimums are: $1.25 to $1.87 for skilled labor per hour; $1.00 to $1.25 for semi-skilled, 95¢ for common.

BIDS: Eight bids were received at Yuma, Arizona on Oct. 15, 1945, ranging from the low of $271,005 to $497,572.

LIST OF BIDDERS:

1. Clyde W. Wood, Inc., Los Angeles, Calif. $271,005
2. Guerin Brothers, Los Angeles, Calif. 298,274
3. Fisher Contracting Co., Phoenix, Ariz. 302,368
4. Rhodes Brothers & Shofner, Los Angeles, Calif. 311,230
5. M. H. Hasler, Santa Ana, Calif. 343,175
6. Mittry Bros. Constr. Co., Los Angeles, Calif. 403,580
7. Ralph A. Bell & A. F. Heinze, Monrovia, Calif. 403,804
8. The Concrete Pipe Constructors, Los Angeles, Calif. 497,572

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation for bypass	175,000 c. y.	$0.25	$0.38	$0.50
2. Constructing dike embankments	10,000 c. y.	.20	.65	.95
3. Excavation for structures	12,400 c. y.	1.25	1.10	1.00
4. Compacted fill under structure	4,600 c. y.	1.50	1.20	2.50
5. Construction of reverse filter	110 c. y.	3.00	7.00	4.57
6. Backfill about structure	4,000 c. y.	.35	1.00	.72
7. Compacting backfill	2,400 c. y.	2.00	1.10	2.38
8. Removing dike embankments	10,000 c. y.	.20	.55	1.00
9. Backfill in bypass channel	175,000 c. y.	.20	.20	.23
10. Placing riprap 12 inches thick	500 c. y.	3.00	6.00	5.00
11. Placing riprap 24 inches thick with 6-inch gravel blanket	5,500 c. y.	3.00	4.50	4.23
12. Concrete in paving panels	970 c. y.	22.00	19.00	18.00
13. Concrete in structure except in paving panels	1,460 c. y.	30.00	22.00	22.00
14. Placing reinforcement bars	240,000 lbs.	.04	.03	.03
15. Placing asbestos-cement pipe	160 l. f.	1.50	3.00	1.60
16. Placing elastic joint-filler material	1,830 s. f.	1.50	1.50	.80
17. Placing rubber water stops	1,780 l. f.	.50	1.00	.95
18. Driving steel sheet piling	4,410 l. f.	1.00	2.90	1.58
19. Installing radial gates and hoists	148,000 lbs.	.15	.10	.06
20. Installing miscellaneous metalwork	7,000 lbs.	.20	.35	.19
21. Installing electrical metal conduit	700 l. f.	.50	2.00	.72
22. Installing electrical ground wires	50 lbs.	.50	5.00	1.00



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No matter how light or tough the material may be, the Page Automatic will always dig right in and come up with a full pay load.

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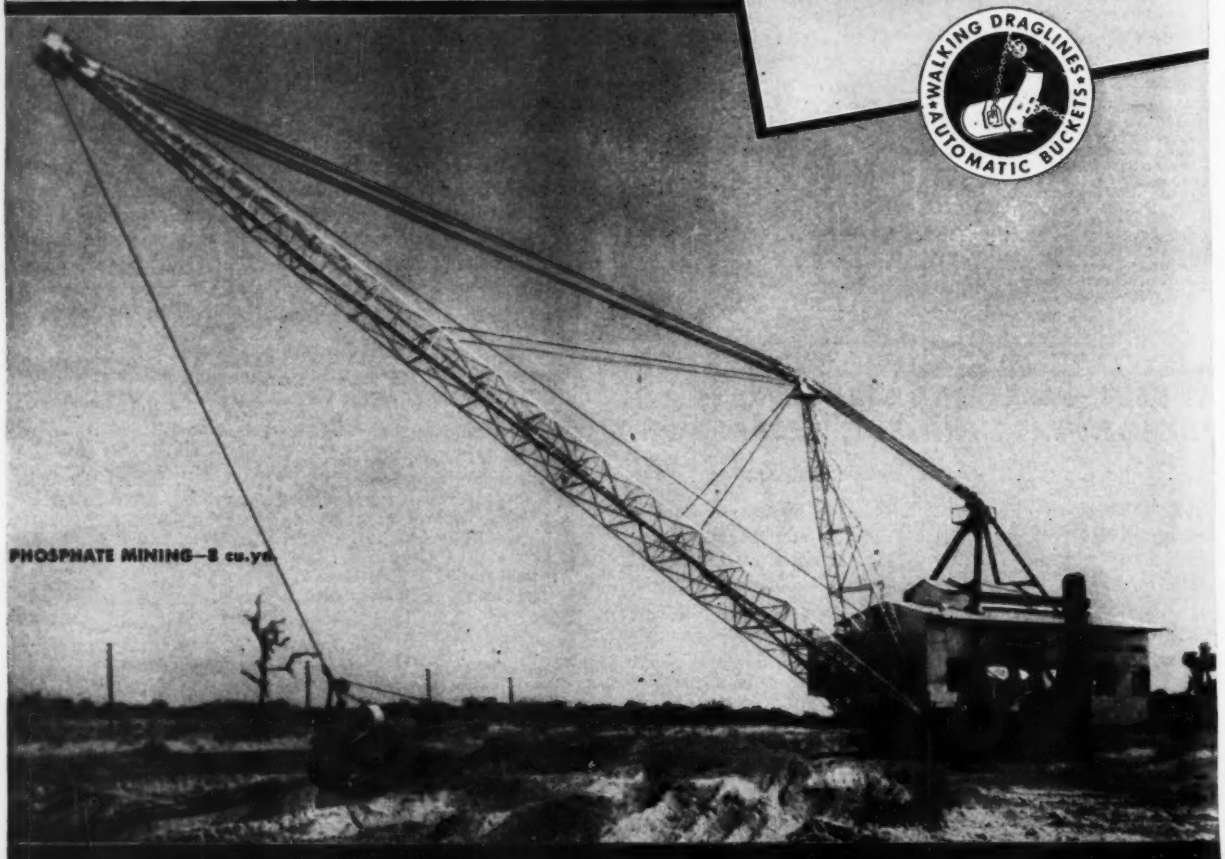


PAGE ENGINEERING COMPANY
CHICAGO 38, ILLINOIS

WALL AND APPURTENANT WORKS PORTSMOUTH-NEW BOSTON, OHIO RIVER

OWNER: United States Engineers, Court House Building, Cincinnati, Ohio, Col. Peschal N. Strong, chief engineer.

PROJECT: The flood wall and appurtenant works to be constructed are a part of a project for protecting the low lying portions of the cities of Portsmouth and New Boston, Ohio, from being flooded during the occurrence of high water in the Ohio River. The major structures are to be a reinforced concrete wall (approximately 7300 feet long and 20 feet high), gate abutments, gate and gate storage house, access bridge, sluice gate well, trash rack, sewer and perforated drains. The site of the work is in the cities of Portsmouth and New Boston, Scioto County, Ohio. These two cities are located on the right bank of the Ohio river, about 356 miles below Pittsburg, Pennsylvania.

CONDITIONS: Contractor to furnish all materials, equipment supplies, labor and transportation, including fuel, power and water. The contractor will also preserve and protect all existing vegetation such as trees, shrubs and grass on or adjacent to the site which do not reasonably interfere with construction. Rail, highway and water transportation (Ohio River) is available. Power may be secured from the Ohio Power Company and water from the municipally owned utility in the city of Portsmouth. The contractor is to provide the water supply to the site, laying all necessary piping and at the termination of the work this piping must be removed. One condition that may arise is the flooding of the Ohio river and if this should occur and damage results to the work through no fault of the contractor additional payment will be made at the unit or lump sum prices established in the contract. The prevailing wage rates are to be: $1.625 per hr. for skilled labor; $1.00 to $1.50 per hr. for semi-skilled and $.75 per hr. for common. The bids were received on August 21. 1945 and the stipulated contract time is August 31, 1946, allowing about 365 calendar days for the work.

BIDS: Five bids were received on August 21, 1945, ranging from the contract low of $854.892.00 to the high of $1.038,-618.00

LIST OF BIDDERS:

1. Dravo Corporation, Pittsburg, Pa.... (contract) $854,892.00
2. Foster & Creighton Co., Nashville, Tenn..... 904,197.00
3. Johnson, Drake & Piper, Inc., New York, N. Y.. 936,306.00
4. L. B. Strandberg & Son, Chicago, Ill..... 941,585.00
5. LaCrosse Dredging Corp., Chicago, Ill..... 1,038,618.00

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing, grubbing and removal of structures	1 job	$1,500.00	$4,000.00	$7,000.00
2. Removal of concrete walls and foundation	317 cu. yd.	10.00	5.00	13.00
3. Removal of portion of 96" x 96" reinforced concrete sewer	28 lin. ft.	300.00	200.00	100.00
4. Structure excavation including stripping for embankment	64,000 cu. yd.	1.25	1.90	1.55
5. Compacted backfill	71,000 cu. yd.	.95	1.10	1.90
6. Uncompacted backfill	145,000 cu. yd.	.70	.65	.65
7. Sand and coarse aggregate filters	4,000 cu. yd.	2.70	1.70	3.50
8. Concrete	20,000 cu. yd.	18.00	19.00	17.65
9. Reinforcement steel	2,703,000 pound	.06	.06	.065
10. Dumped riprap	3,550 cu. yd.	12.00	7.00	6.00
11. Perforated reinforced concrete pipe 10" diameter	7,300 lin. ft.	3.00	2.00	1.50
12. Reinforced concrete pipe 12" diameter, complete	76 lin. ft.	3.00	12.00	1.20
13. Access bridge, complete	1 job	2,100.00	1,100.00	3,850.00
14. Manholes (brick) complete, except excavation and backfill	2 each	300.00	140.00	200.00
15. Miscellaneous metal	7,850 pound	.30	.40	.50
16. Gate storage house door & frame for gate No. 10	1 each	450.00	310.00	300.00
17. Louvers	3 each	70.00	30.00	50.00
18. Hand rail	213 lin. ft.	6.00	5.00	7.00
19. Sluice gate 7'-0" wide x 7'-0" high	1 each	4,500.00	5,300.00	5,000.00
20. Movable gate closure No. 10	1 job	1,400.00	1,400.00	2,500.00
21. Cement	25,000 bbls.	2.25	2.70	2.80
22. Copper water stop	15,000 pound	.75	.00	.50
23. Compacting for three additional passes	1,000 100 s.f.:	.05	.35	.25
24. Top soil	1,900 cu. yd.	1.00	.70	1.60
25. Seeding	2.4 acre	100.00	200.00	300.00
26. Sewer pipe, 10" diameter plain, complete	150 lin. ft.	1.50	1.55	.80
27. Sewer pipe 6" diameter, plain and perforated, complete	60 lin. ft.	1.50	.70	1.00
28. Catch basins, complete except excavations and backfill	2 each	150.00	90.00	100.00
29. Grouted gutters	28 cu. yd.	30.00	27.00	30.00
30. Drilled weep holes 3" diameter	26 lin. ft.	1.00	10.00	3.00
31. Gate storage house door and frame for Gate No. 9	1 each	450.00	230.00	400.00
32. Moveable gate closure No. 9	1 job	2,000.00	1,500.00	3,000.00

EARTHWORK AND RIPRAP ALTUS PROJECT, OKLAHOMA

OWNER: Bureau of Reclamation, Altus, Okla.

PROJECT: Embankment and riprap for the reconstruction of the Chicago, Rock Island and Pacific Railway and State Highway No. 9 across the north fork of the Red River, and the riprap on the South Dike and Lugert Dike, Altus Reservoir, Altus project, Oklahoma. Work is located 23 and 17 miles north of Altus, Okla. (Spec. No. 1084).

CONDITIONS: Government to furnish concrete pipe for culverts and cement for use in mortar, and they will be delivered to contractor at Altus Dam. Contractor to furnish all other materials and complete work that will be submerged in Altus Reservoir in 60 calendar days, and all remaining work within 120 calendar days. Preference rating is AA-3. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.125 to $1.50; semi-skilled, 57½c. to $1.00; and common labor, 57½c.

BIDS: Six bids were received January 6, 1945 ranging from the low of $175,800 to $358,980.

LIST OF BIDDERS: (Combination of both schedules)

1. Brazos Valley Constr. Co., Mineral Wells, Tex. (low bidder) $175,800
2. Morrison-Knudsen Co., Inc., Boise, Idaho 180,260
3. Brown Construction Co., Pueblo, Colo. 190,900
4. Austin Contracting Co., Dallas, Tex. 194,950
5. Amis Construction Co., Oklahoma City, Okla. 287,600
6. Leo Sanders, Oklahoma City, Okla. 358,980

Schedule I

Ite	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, all classes, in borrow pits and transport, to embankmt	120,000 c. y.	$0.27	$0.35	$0.40
2. Compacting embankment	100,000 c. y.	.07	.10	.10
3. Placing ballast	3,000 c. y.	.25	.50	1.00
4. Riprap for railroad and highway	32,000 c. y.	3.45	2.90	3.00
5. Stock-piling riprap	3,000 c. y.	3.25	2.50	2.50
6. Lay 24-in. concrete pipe	120 l. f.	3.25	4.00	10.00

Schedule II

7. Riprap for South Dike	2,600 c. y.	1.35	2.30	2.00
8. Riprap for Lugert Dike	8,000 c. y.	1.45	2.50	2.50

RIPRAP PLACEMENT, COLORADO

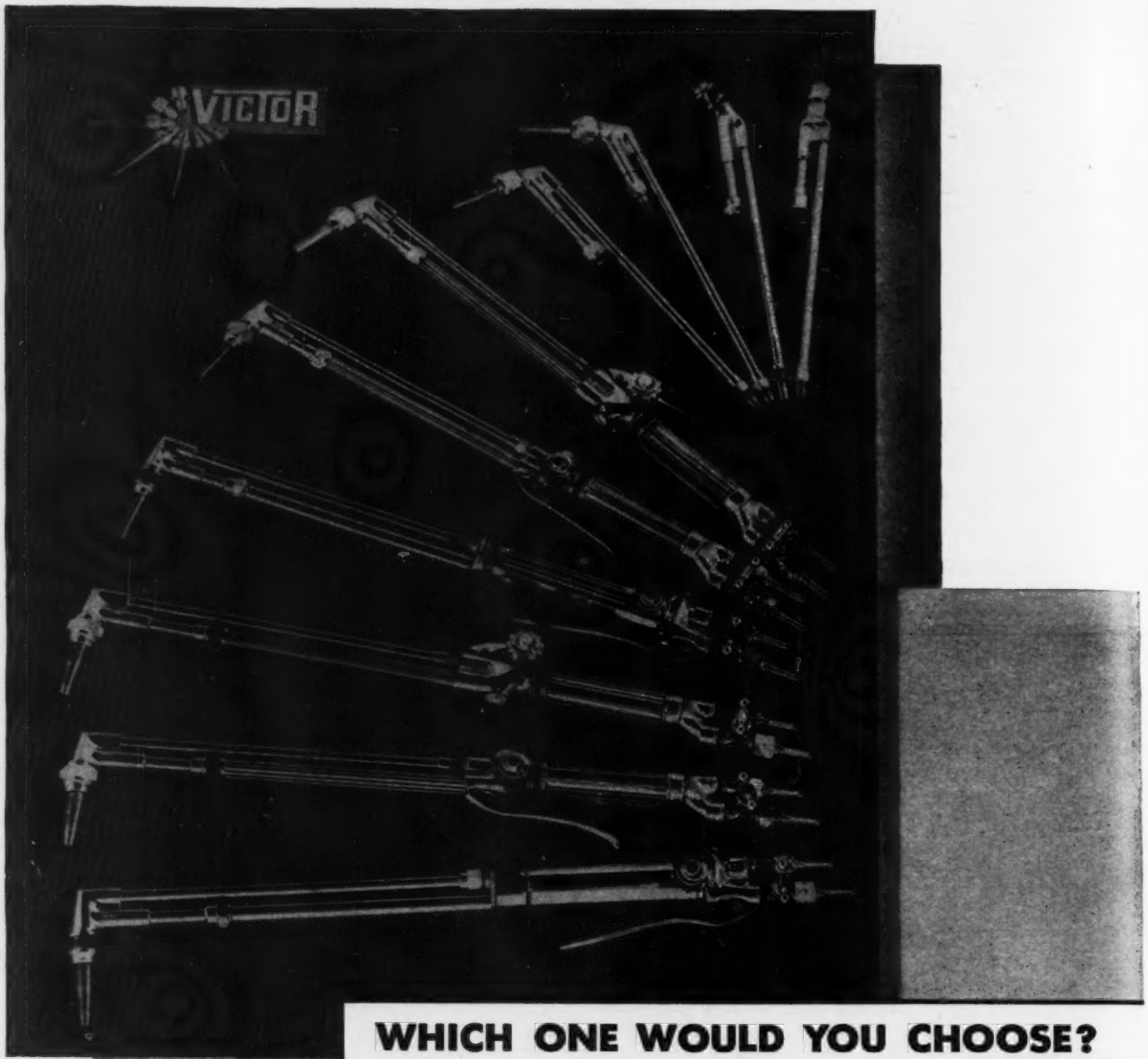
OWNER: Bureau of Reclamation-Big Thompson project, Colorado. C. H. Howell, project engineer.

BIDS: Two bids were received on November 19, 1945, ranging from the low of $23,300 to $32,500.

LIST OF BIDDERS:

1. Henry Shore, Littleton, Colo. $23,300
2. Trione Contracting Co., Denver, Colo. 32,500

Item	Quan.	Unit Prices (1)	(2)
1. Producing and transporting riprap	4,700 c. y.	$4.00	$5.00
2. Placing riprap on upstream slopes of embankments	4,300 c. y.	1.00	2.00
3. Stockpiling riprap material	400 c. y.	.50	1.00



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PREPARATION OF CONCRETE AGGREGATES — CALIFORNIA

OWNER: Bureau of Reclamation—Central Valley project, California: R. K. Durant, construction engineer.

PROJECT: Excavation and preparation of 300,000 cu. yds. of sand and coarse aggregate for the Friant-Kern Canal at the Central Valley project, near Friant, California.

BIDS: Fourteen bids were received on November 20, 1945, ranging from the low of $207,500 to $457,500. The high bid being 120% greater than the low.

LIST OF BIDDERS:

1. George Pollock Co., Sacramento, Calif. $207,500
2. Marshall S. Hanrahan, Redwood City, Calif. 239,500
3. E. J. Warner, Stockton, Calif. 249,500
4. W. J. Davis, Jr., Yuba City, Calif. 251,000
5. A. Tiechert & Son, Inc., Sacramento, Calif. 279,000
6. Rhodes Bros. & Shofner, Los Angeles, Calif. 284,500
7. Claude C. Wood, Lodi, Calif. 287,500
8. Triangle Rock & Gravel Co., San Bernardino, Calif. 289,000

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, stripping deposit	50,000 c. y.	$0.25	$0.05	$0.25
2. Preparing and stock-piling sand	110,000 c. y.	.65	.79	.79
3. Prep. and stock-piling coarse aggregate 3/16 to 3/8 in.	40,000 c. y.	.65	.79	.79
4. Prep. and stock-piling coarse aggregate 3/8 in. to 3/4 in.	70,000 c. y.	.65	.79	.79
5. Prep. and stock-piling coarse aggregate 3/4 in. to 1½ in.	80,000 c. y.	.65	.79	.79

PUMPING PLANT AND EARTHWORK MILK RIVER PROJECT, MONTANA

OWNER: Bureau of Reclamation, United States Department of the Interior, Malta, Montana. Mr. H. W. Genger, superintendent.

PROJECT: Construction of the pumping plant including all required excavation, backfill and grading; the complete construction of a reinforced concrete pumping plant structure; construction of two 28 in. inside-diameter steel pipe discharge lines; the installation of one pumping unit and a three-ton, hand operated hoist and trolley, plus the installation of all electrical equipment and accessories. Work on the canals and laterals including the earthwork and structures between the Dodson North canal and the pumping plant; the canal beyond the pumping plant; the laterals from the canal; and the channel change and dike for the control of Dodson Creek.

CONDITIONS: The Government will furnish all cement for use in concrete, mortar, and grout; all reinforcement bars; metergates and vertical gates; the pumping unit; all electrical conduits, conductors, ground wires and boxes; miscellaneous other items. Contractor to furnish all materials required for the completion of the work and to complete work within 175 calendar days. Delays due to action of the Manpower Commission becoming effective subsequent to the date of the bid shall be considered to be delays due to unforeseeable causes, and beyond the control of the contractor. Minimum rate of wages prevailing at the site of work are; $1.37 to $1.50 per hr. for skilled labor; 82¢ to $1.00 for semi-skilled, and 75¢ for common.

BIDS: Five bids were received on September 20, 1945 ranging from the low of $52,582.50 to $66,231.26.

LIST OF BIDDERS:

1. Union Const. Co., Great Falls, Montana $52,583
2. M. G. Long, Billings, Montana 54,594
3. Campbell Const. Co., Malta, Montana 55,046
4. McLaughlin Const. Co., Livingston, Mont. 59,394
5. S. Birch & Sons, Great Falls, Montana 66,231

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unwatering foundation for pumping station	Lump Sum	$200.00	$2,000.00	$1,800.00
2. Excavation, all classes, for structures	1,200 c. y.	3.00	2.50	2.50
3. Excavation, all classes, for canal	53,000 c. y.	.43	.35	.27
4. Overhaul	2,000 sta. c. y.	.05	.05	.05
5. Backfill	750 c. y.	.50	1.00	1.50
6. Puddling or tamping backfill	350 c. y.	2.00	3.00	2.00
7. Concrete in structures	276 c. y.	40.00	50.00	58.00
8. Placing reinforcement bars	36,000 lb.	.08	.05	.08
9. Dry-rock paving	350 s. y.	5.00	3.00	8.50
10. Furnishing and driving untreated timber piles	630 l. f.	1.75	2.00	3.00
11. Furnishing and driving treated timber piles	160 l. f.	2.00	3.00	3.10
12. Erecting timber in structures	15 M. ft. B.M.	75.00	75.00	100.00
13. Furnishing and installing doors and windows	140 s. f.	1.50	2.00	4.50
14. Furnishing and installing roofing	Lump Sum	175.00	200.00	300.00
15. Installing gates	5,700 lb.	.20	.15	.20
16. Furnishing and installing pump discharge pipe connections	1,250 lb.	.40	.40	.55
17. Laying steel pipe for pump discharge line	320 l. f.	1.00	6.00	5.00
8. Laying 15 in. dia. corr. metal pipe	260 l. f.	.50	1.00	.80
9. Laying 18 in. dia. corr. metal pipe	48 l. f.	.50	1.00	.75
20. Laying 24 in. dia. corr. metal pipe	90 l. f.	.50	1.50	1.00
21. Laying 30 in. dia. corr. metal pipe	284 l. f.	4.00	4.00	1.25
22. Laying 36 in. dia. corr. metal pipe	150 l. f.	3.00	4.00	2.00
23. Furnishing and installing misc. metal-work	2,500 lb.	.40	.40	.60
24. Installing pumping unit	5,500 lb.	.15	.15	.10
25. Furnishing and installing hoist and trolley	Lump Sum	325.00	400.00	275.00
26. Installing electrical metal conduit	220 l. f.	.25	1.00	.50
27. Installing grounding system	150 lb.	.30	1.00	.15
28. Installing electrical conductors and apparatus	1,100 lb.	.20	1.00	.35

REFUSE INCINERATOR, LYTTONSVILLE, MARYLAND

OWNER: Washington Suburban Sanitary Comn., Hyattsville, Md.; Harry R. Hall, chief engineer.

PROJECT: Construction of a 150-ton refuse incinerator, including appurtenant structures. Building is 50- by 130-ft. reinforced concrete, structural steel and tile. Project also includes construction of chimney, roads, drains, and sewers.

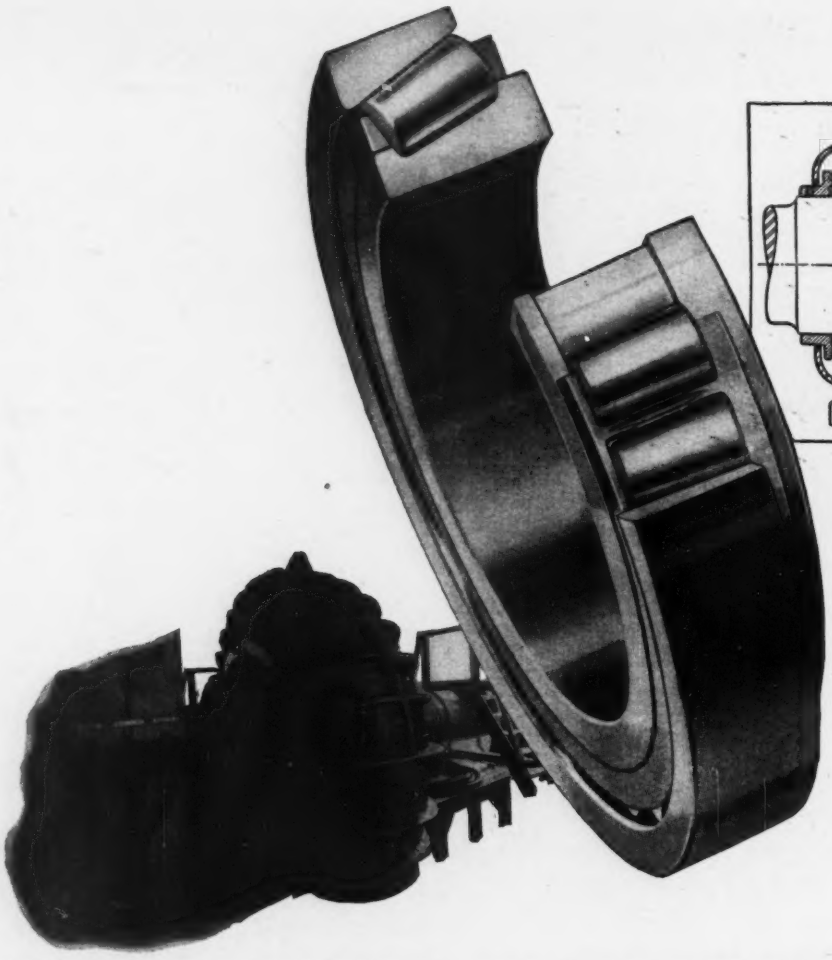
CONDITIONS: Incinerator building has been designed to house units of size originally specified, but certain variations are permitted in design, including assemblies, which may result in an installation being approved that may require structural changes in the building. All bidders propose to furnish same type incinerator, installed by the Nichols Engineering and Research Corp. Contractor to furnish all labor and materials except those specified as being furnished by the Commission. Time for completion: 200 consecutive days. Wage rates are those prevailing in Washington and vicinity: skilled labor, $1.50 to $2.00 per hr.; semi-skilled, $1.10 to $1.62; and common, 90c. Priority rating AA-3 on equipment, materials and machinery.

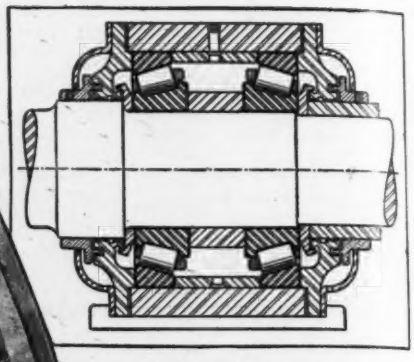
BIDS: Five bids were received March 23, 1945, ranging from the low of $248,800 to $299,675. Engineer's estimate $208,000.

LIST OF BIDDERS:

1. F. H. Martell Co., Washington, D.C. (low bidder) . $248,800
2. Nichols Engr. & Research Corp., New York, N. Y. . 256,397
3. J. D. Hedin Constr. Co., Washington, D.C. 264,796
4. Potts & Callahan Cont'g. Co., Washington, D.C. . . 293,098
5. Victor Frankil (trading as Baltimore Contractors), Baltimore, Md. 299,675

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Constructing refuse incinerator	Lump sum	$234,570.00	$243,281.00	$255,668.00
2. Structure excavation	3,450 c. y.	.80	1.17	.75
3. Trench excavation	610 c. y.	10.00	1.30	2.00
4. Roadway and grading excavation	570 c. y.	1.00	1.17	1.00
5. Borrow excavation	4,500 c. y.	1.00	1.80	1.00
6. Rock excavation	50 c. y.	6.00	10.40	5.00





X-Section drawing shows two Torrington single-row Tapered Roller Bearings as used at Fort Peck Dam in the 28" Bucyrus-Erie Dredge Pump.

CARRYING PUMPING LOADS AT FORT PECK DAM

In 1934, dredge pumps manufactured by Bucyrus-Erie Company of South Milwaukee, Wisconsin, were used at the Fort Peck Dam. Two high-capacity, Torrington single-row Tapered Roller bearings were specified to carry the heavy combined radial and thrust loads imposed by the 28" diameter (discharge) pumping units, each driven by a 2500 h.p. motor at 253 r.p.m. full load speed.

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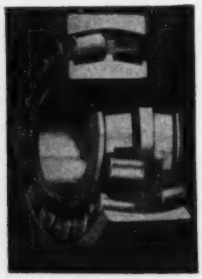

features self-alignment, two-directional thrust and unit construction for easy installation and handling. It will be manufactured in a complete range of sizes from 1.5748" bore and up. See your nearest Torrington Representative or write for further information.

TORRINGTON BEARINGS

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DAVIS DAM AND POWER PLANT
ARIZONA—NEVADA

OWNER: Bureau of Reclamation, Davis Dam Project, Arizona-Nevada, Kingman, Arizona. S. O. Harper, Chief Engineer. H. Bahmeier, Construction Engineer.

PROJECT: Construction of Davis Dam, an earth and rock-fill dam across the Colorado River, approximately 30 miles west of Kingman, Arizona; and diversion channel through left abutment which forms forbay with concrete penstock, outlet and spillway structures across downstream and of forebay channel. Power plant to be located on left bank of river at downstream toe of penstock structure.

BIDS: Four bids were received December 21, 1945, ranging from the contract low of $21,462,505 to $27,481,947.50.

LIST OF BIDDERS:

1. Utah Construction Co., San Francisco, Calif. (contract) $21,462,505
2. Arizona-Nevada Constructors, a joint venture composed of: S. J. Groves & Sons, Minneapolis; Tanner Construction Co., Arizona; Lee Moor Contracting Co., Arizona; L. M. White; L. Lynch; Bowers and McLaughlin; S. A. Healy Co. $22,805,940
3. Davis Constructors, a joint venture composed of: Griffith Co.; Grafe-Callahan Constr. Co.; Peter Kiewit Sons' Co.; Shofner, Gordon, Hinman; Martin Wunderlich; Gunther & Shirley Co.; Hunkin-Conkey Co.; Brown & Root, Inc., Condon-Cunningham Co.; D. G. Gordon; J. C. McGuire & Co. $23,242,990
4. Dam Builders, Inc., a Nevada Corporation $27,481,947

This contract was previously let and awarded to Utah Construction Co., in May 15, 1942, *ENR* April 22, 1943, vol. page 641 for its low bid of $18,996,392.

In the comparison of the two low bids, one made in May 1942 and the present one in December 1945—an increase in labor costs during this period is reflected. The large-scale excavation jobs show no appreciable increase in unit prices. In 1942, 2,100,000 cu. yds. of common excavation was bid at $2.50 per yd.—while the same job was rebid in 1945 for 2,300,000 cu. yds. at $2.50.

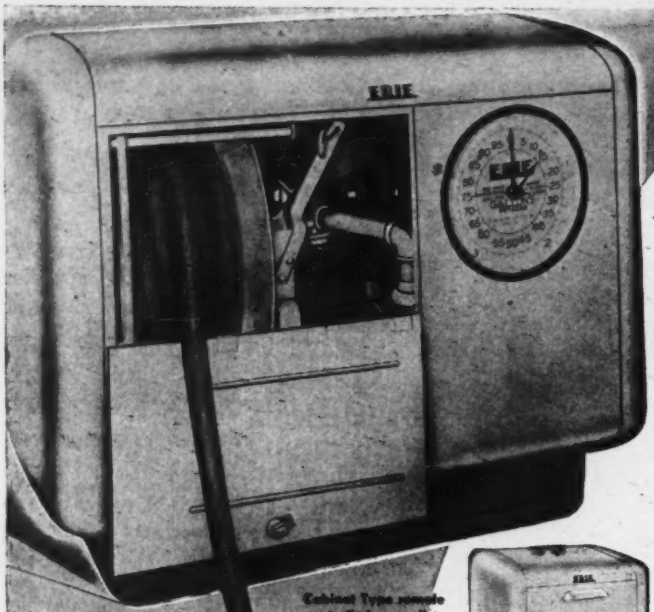
Those jobs requiring large amounts of labor (placing, finishing and installing) did increase. The placement of 14,000,000 lbs. of reinforcement bars bid at $.026 in 1942, was bid $.033 in 1945. Installation of 1,625,000 lbs. penstocks bid at $.035 in 1942 was bid at $.048 in 1945, and the installation of 2,500 lin. ft. of copper tubing for pizometers bid at $.40 per ft. in 1942 was bid at $.60 in 1945.

For labor cost comparison, the page rates prevailing at the site in 1942 and those prevailing at the present time are recorded below:

1942		1945	
Skilled Labor	$1.125 to $1.65	Skilled Labor	$1.375 to $1.75
Semi-skilled	0.875 to 1.25	Semi-skilled	1.25 to 1.375
Common Labor	0.825 to 0.90	Common Labor	1.00 to 1.25

Item No.	Item	Quantity	Unit Price	Unit Price	Unit Price
1.	Diversion and care of river during construction and unwatering foundations	Lump	800,000	960,000	1,355,000
2.	Excavation, stripping sand and coarse-aggregate deposit	200,000 cu. yd.	$0.25	$0.27	$0.50
3.	Excavation, stripping borrow pits	40,000 cu. yd.	.30	.27	.50
4.	Excavation, all classes, for diversion, spillway and outlet, and tailrace channels	1,000,000 cu. yd.	.71	1.00	.80
5.	Excavation, all classes, for forebay channel, roads, switchyard and parking area, and above elevation 520 for power-plant, intake, and spillway and outlet structures	2,300,000 cu. yd.	2.50	2.40	2.65
6.	Excavation, rock, below elevation 520 for power-plant, intake, and spillway and outlet structures	250,000 cu. yd.	4.70	5.00	3.00
7.	Drilling line holes for rock excavation	200,000 lin. ft.	.64	.40	.80
8.	Excavation, all classes, in tunnels and shafts	800 cu. yd.	30.00	35.00	30.00
9.	Excavation, common, for foundation of dam embankment above elevation 455	500,000 cu. yd.	.56	1.00	.50
10.	Excavation, common, for foundation of dam embankment below elevation 455	40,000 cu. yd.	2.00	1.65	1.50
11.	Excavation, rock, for foundation of dam embankment	18,000 cu. yd.	4.00	3.35	9.00
12.	Excavation, rock, for footings of concrete cut-off walls under dam embankment	600 cu. yd.	30.00	35.00	35.00
13.	Excavation, rock, for open cut-off trench under dam embankment on left abutment	1,000 cu. yd.	15.00	14.00	8.00
14.	Excavation, rock, for keys for switchyard footings	150 cu. yd.	30.00	35.00	40.00
15.	Backfill	5,000 cu. yd.	1.20	3.50	3.00
16.	Fills back of walls	30,000 cu. yd.	.75	1.25	1.00
17.	Rock fills back of gravity walls	30,000 cu. yd.	.65	.42	1.00
18.	Sand and gravel filter blanket under riprap	18,000 cu. yd.	1.00	1.65	1.00
19.	Riprap	87,000 cu. yd.	.90	1.65	1.00
20.	Rock surfacing	1,000 cu. yd.	.55	.65	2.5
21.	Road and parking-area surfacing	10,000 cu. yd.	3.00	4.00	3.00
22.	Excavation, common, in borrow pits and transportation to dam embankment	1,180,000 cu. yd.	.60	.65	.65
23.	Separating rock materials	2,000,000 cu. yd.	.33	.30	.40
24.	Loading and hauling stock-piled materials	3,000,000 cu. yd.	.44	.30	.30
25.	Earth fill in dam embankment	1,000,000 cu. yd.	.17	.25	.15
26.	Rock screenings in dam embankment	1,400,000 cu. yd.	.10	.15	.15
27.	Mechanical tamping of embankment materials	12,000 cu. yd.	2.50	5.00	3.50
28.	Rock fill in dam embankment	1,400,000 cu. yd.	.105	.15	.15
29.	Rubble-masonry walls	400 cu. yd.	30.00	50.00	40.00
30.	Rubble-concrete paving	750 cu. yd.	20.00	40.00	30.00
31.	Drilling holes for setting foundation drainage pipes	200 hole	10.50	15.00	7.00
32.	Drilling drainage holes not more than 25 feet deep in foundations	2,000 lin. ft.	5.35	7.00	6.00
33.	Drilling drainage holes more than 25 feet deep and not more than 50 feet deep in foundations	6,500 lin. ft.	5.35	7.00	6.00
34.	Constructing 6-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	3,000 lin. ft.	.87	1.25	2.00
35.	Constructing 8-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	7,000 lin. ft.	1.10	1.50	2.00
36.	Constructing 10-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	200 lin. ft.	1.35	1.90	3.00
37.	Constructing 12-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	3,100 lin. ft.	1.40	2.50	3.00
38.	Constructing 24-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	300 lin. ft.	3.60	4.00	6.00
39.	Laying 6-inch diameter sewer-pipe with cemented joints	650 lin. ft.	1.25	1.50	1.00
40.	Laying 8-inch diameter sewer-pipe with cemented joints	150 lin. ft.	1.50	2.10	1.00
41.	Laying 10-inch diameter sewer-pipe with cemented joints	200 lin. ft.	1.60	2.50	2.00
42.	Laying 12-inch diameter sewer-pipe with cemented joints	450 lin. ft.	1.70	3.60	2.00
43.	Laying 24-inch diameter sewer pipe with cemented joints	150 lin. ft.	2.60	5.00	5.00
44.	Constructing 24-inch diameter concrete pipe drains	300 lin. ft.	3.50	6.00	9.00
45.	Placing 6-inch diameter split tile drains	7,000 lin. ft.	1.00	.70	2.00
46.	Placing 8-inch square tile drains	9,500 lin. ft.	1.50	1.50	3.00
47.	Screened gravel under fills back of walls	350 cu. yd.	4.50	9.00	5.00
48.	Drilling weep holes	200 lin. ft.	2.40	9.00	3.00
49.	Core drilling 5½-inch diameter holes not more than 30 feet deep	2,000 lin. ft.	15.00	12.60	10.00
50.	Drilling 1¼-inch diameter grout holes not more than 35 feet deep	30,000 lin. ft.	1.35	2.28	1.75
51.	Drilling 1¼-inch diameter grout holes more than 35 feet deep, but not more than 60 feet deep	50,000 lin. ft.	1.35	2.28	1.85
52.	Drilling 1¼-inch diameter grout holes more than 60 feet deep but not more than 110 feet deep	42,000 lin. ft.	1.35	2.28	2.00
53.	Drilling 1¼-inch diameter grout holes more than 110 feet deep but not more than 160 feet deep	20,000 lin. ft.	1.35	2.28	2.10
54.	Drilling 1¼-inch diameter grout holes more than 160 feet deep but not more than 210 feet deep	110,000 lin. ft.	1.35	2.28	2.25
55.	Drilling 1¼-inch diameter grout holes more than 210 feet deep but not more than 260 feet deep	3,000 lin. ft.	1.35	2.28	3.00
56.	Placing pipe and fittings for foundation grouting and drainage	100,000 pound	.24	.25	.20
57.	Pressure grouting foundations	300,000 cu. ft.	1.75	1.10	1.50
58.	Pressure grouting with packers	60,000 cu. ft.	2.20	1.90	2.50
59.	Placing metal tubing and fittings for grouting contraction joints	30,000 pound	.30	.25	.35
60.	Pressure grouting contraction joints and cooling systems	2,000 cu. ft.	.80	2.90	6.00
61.	Drilling holes for anchor bars and grouting bars in place	60,000 lin. ft.	1.40	.85	1.25

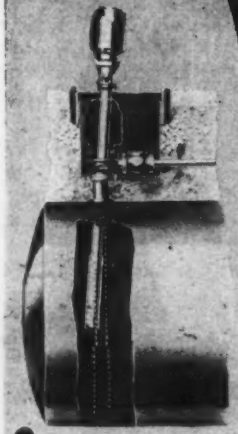
(Continued on following page)



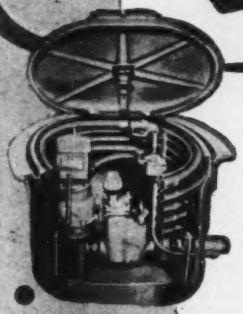
ERIE Flight Fueler

For fueling small planes, Erie's above-ground cabinet unit — 20 G P M capacity, shipped completely assembled, needs only to be connected to suction line and electric outlet and it's ready for fueling thru 50 ft. of reeled hose.

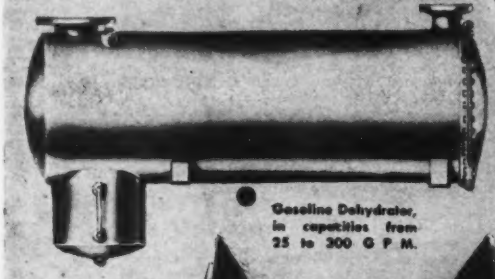
Cabinet Type remote controlled, gasoline pumping units in 3 sizes, 25, 30, or 40 G P M.



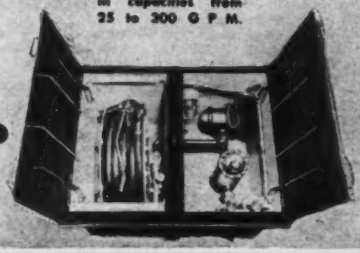
Submerged Turbine Pump, in capacities from 25 to 500 G P M.



JR. Fueling Pit in 2 sizes, 25 or 40 G P M.



Gasoline Dehydrator, in capacities from 25 to 300 G P M.



SR. Fueling Pit in 2 sizes, 50 or 100 G P M.

ERIE has developed its Airport Fueling line to meet any airport fueling requirement from the smallest airpark to the largest of class 5 fields. Our more than 25 years of specialized experience in the design and manufacture of petroleum products dispensing equipment is evident in the completeness of our Airport Line. We have the various units in a wide range of capacities but, of greatest value to you, we have the experience and willingness to work with you in arranging these units to your best advantage. HOW CAN WE SERVE YOU?

Look for **ERIE**

ERIE METER SYSTEMS, INC.

Main Office and Plant: Erie, Pa.

DAVIS DAM AND POWER PLANT
ARIZONA — NEVADA

(*Continued from preceding page*)

Item No.	Item	Quantity	Unit Price	Unit Price	Unit Price
62.	Concrete in floor of forebay channel	1,600 cu. yd.	14.75	15.00	20.00
63.	Concrete in slope paving of forebay channel	30,000 cu. yd.	36.50	29.00	30.00
64.	Concrete in intake structure below elevation 647	165,000 cu. yd.	8.90	11.00	8.00
65.	Concrete in intake structure above elevation 647	6,500 cu. yd.	14.50	16.50	40.00
66.	Concrete in trashracks	5,000 cu. yd.	45.00	65.00	70.00
67.	Concrete in gate-erection pit	350 cu. yd.	32.75	65.00	40.00
68.	Concrete in tunnels and shafts	300 cu. yd.	50.00	65.00	50.00
69.	Concrete in left outlet abutment below elevation 647	16,000 cu. yd.	14.85	20.00	9.00
70.	Concrete in left outlet abutment above elevation 647	2,000 cu. yd.	20.50	16.00	25.00
71.	Concrete in piers and walls of spillway and outlet structure	50,000 cu. yd.	13.90	20.00	20.00
72.	Concrete in radial-gate sill and spillway crest	50,000 cu. yd.	9.15	12.00	10.00
73.	Concrete in floor of spillway and outlet structure	12,000 cu. yd.	12.70	11.00	15.00
74.	Concrete in lining of spillway and outlet channel	5,000 cu. yd.	17.75	20.00	20.00
75.	Concrete in bridges, walks, and operating floors of spillway and outlet structure	1,200 cu. yd.	57.00	35.00	80.00
76.	Concrete in superstructure of spillway	2,000 cu. yd.	50.00	50.00	80.00
77.	Concrete in blockouts	450 cu. yd.	34.00	35.00	50.00
78.	Concrete in substructure of power plant	26,000 cu. yd.	13.20	15.00	15.00
79.	Concrete in intermediate structure of power plant	18,000 cu. yd.	25.00	20.00	32.00
80.	Concrete in superstructure of power plant	3,500 cu. yd.	67.50	66.00	90.00
81.	Second-stage concrete in power-plant structure	22,400 cu. yd.	17.85	20.00	25.00
82.	Third-stage concrete in power-plant structure	2,100 cu. yd.	15.65	36.00	50.00
83.	Concrete in gravity walls	28,500 cu. yd.	17.90	20.00	13.00
84.	Concrete in footings of embankment cut-off walls	700 cu. yd.	16.25	30.00	20.00
85.	Concrete in embankment cut-off walls, except footings	400 cu. yd.	45.00	66.00	60.00
86.	Concrete in sidewalks, curbs, and gutters	800 cu. yd.	60.00	66.00	60.00
87.	Concrete in parapet walls along roadways	700 cu. yd.	55.50	85.00	50.00
88.	Concrete in switchyard structures	5,000 cu. yd.	63.00	85.00	50.00
89.	Placing reinforcement bars	15,500,000 pound	.033	.035	.043
90.	Placing metal tubing and fittings for concrete-cooling system	250,000 pound	.15	.20	.25
91.	Cooling concrete	240,000 cu. yd.	.60	.40	.50
92.	Chipping and roughening concrete surfaces	5,000 sq. yd.	5.20	1.65	2.50
93.	Finishing lighting recesses	165 recess	7.00	10.00	10.00
94.	Placing metal sealing strips	26,000 lin. ft.	.83	.40	1.00
95.	Placing metal cover plates over vent grooves and drainage grooves	5,500 lin. ft.	1.00	.80	1.00
96.	Placing joint filler	52,500 sq. ft.	3.7	.16	.30
97.	Constructing control joints	500 lin. ft.	1.40	1.65	2.50
98.	Constructing asphalt seals	2,250 lin. ft.	4.00	5.00	10.00
99.	Insulating reinforcement bars, electrical metal conduit, and cooling-system tubing	55,000 intersection	.17	.16	.20
100.	Placing insulation on roofs	12,000 sq. ft.	.54	.40	.25
101.	Furnishing materials and placing bituminous-saturated-felt roofing, complete with flashing	16,000 sq. ft.	.53	.35	.45
102.	Furnishing materials and placing membrane waterproofing	40,500 sq. ft.	.58	.35	.40
103.	Dampproofing outside walls	8,000 sq. yd.	.85	.80	.80
104.	Installing gate frames, guides, sills, hinge bases, and thrust blocks for fixed-wheel, bulkhead, and high-head radial gates	970,000 pound	.082	.08	.10
105.	Installing fixed-wheel gates and metalwork for gate counterweights and gate-erection pit	2,160,000 pound	.048	.05	.05
106.	Installing bulkhead gates	435,000 pound	.048	.05	.06
107.	Installing high-head radial gates	410,000 pound	.065	.05	.08
108.	Installing gate hoists for spillway fixed-wheel gates	520,000 pound	.033	.05	.05
109.	Installing gate hoists for penstock fixed-wheel gates	300,000 pound	.048	.05	.05
110.	Installing gate hoists for high-head radial gates	90,000 pound	.058	.05	.05
111.	Installing trashracks	1,400,000 pound	.048	.04	.05
112.	Installing stop-log guides	448,000 pound	.061	.05	.07
113.	Installing penstocks	2,125,000 pound	.048	.045	.06
114.	Installing draft-tube pier noses	150,000 pound	.041	.05	.08
115.	Erecting structural-steel roof framing for power-plant machine shop	130,000 pound	.04	.05	.06
116.	Installing track rails	245,000 pound	.04	.05	.03
117.	Installing cranes	1,502,000 pound	.027	.015	.06
118.	Installing standard metal pipe, fittings, and valves less than 6 inches in diameter	216,000 pound	.19	.15	.13
119.	Installing standard metal pipe, fittings, and valves 6 inches or more in diameter	500,000 pound	.069	.12	.09
120.	Installing metal frames for openings in floors and walls	40,000 pound	1.78	.08	.13
121.	Installing metal inserts	10,000 pound	.30	.25	.22
122.	Installing oil-storage tanks	86,000 pound	.20	.035	.12
123.	Installing pumps	18,000 pound	.096	.17	.12
124.	Installing miscellaneous metalwork	215,000 pound	.27	.25	.25
125.	Constructing temporary gantry-crane-rail extensions	250 lin. ft.	5.00	10.00	15.00
126.	Constructing timber guard and support for conductors	2.0 M ft. b. m.	120.00	250.00	200.00
127.	Installing embedded electrical metal conduit 1¼ inches or less in diameter	11,000 lin. ft.	.65	.25	.90
128.	Installing embedded electrical metal conduit more than 1¼ inches and not larger than 3-inches in diameter	16,000 lin. ft.	1.00	.40	1.80
129.	Installing electrical nonmetallic conduit	17,500 lin. ft.	1.00	.40	1.20
130.	Installing ground wires and ground rods	14,000 pound	.25	.15	.20
131.	Installing electrical cable for resistance thermometers, strain meters, and joint meters embedded in concrete	8,000 lin. ft.	.38	.35	.40
132.	Installing copper tubing for hydraulic pressure piezometers	2,500 lin. ft.	.60	1.65	.50
133.	Transporting freight of all kinds for the Government or its agents, other than the contractor, between the railroad and the dam site	13,300 ton	4.00	6.00	5.00

AIRPORT, BLOOMINGTON, INDIANA

OWNER: Civil Aeronautics Administration, Chicago, Ill. Mr. I. H. Polk, chief engineer.

PROJECT: The clearing, grading drainage and seeding of the Bloomington, Indiana airport, consisting of the following; 210,000 cu. yd. grading; reinstallation of 445 lin. ft. of 24 in. corrugated iron sewer pipe; seeding of 87 acres; sodding 750 sq. yds.; the addition of 60 tons of straw mulch or hay.

CONDITIONS: Contractor to furnish all materials and to complete work in 75 calendar days. Rail and highway transportation facilities available. The prevailing wage rates are: skilled labor $1.25 to $1.65 per hour; semi-skilled, 75¢ to $1.25 and common 75¢ per hour.

BIDS: Seven bids were received on July 2, 1945, ranging from the contract low of $92,593 to the high of $125,865.

LIST OF BIDDERS:

1. Thompson Const. Co., Indianapolis, Ind. (contract) . $ 92,593
2. Ralph Rogers Co., Bloomington, Ind. 93,169
3. Carl Myers Co., Orleans, Ind. 100,579
4. Valley Engr. Co., St. Charles, Ill. 105,028
5. Reith-Riley Const. Co., Goshen, Ind. 110,249
6. Palumbo Exct. Co., Chicago, Ill. 124,163
7. Midland Constructors Inc., Chicago, Ill. 125,865

Item	(Quan.)	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	60 in. dia.	$2.00	$1.50	$0.80
2. Clearing trees	100 in. dia.	2.00	1.00	.70
3. Removing existing fences	500 rods	2.00	.45	.30
4. Remove concrete inlet	1	50.00	45.00	50.00
5. Remove concrete headwall	1	50.00	45.00	50.00
6. Grading, unclassified	210,000 c. y.	.27	.29	.27
7. Remove 24 in. sewer pipe	480 l. f.	1.50	1.00	2.00
8. Reinstalling 24 in. sewer pipe	445 l. f.	3.00	1.10	2.50
9. Storm sewers, in place				
12 in. dia. pipe	250 l. f.	2.25	2.25	1.75
10. 15 in dia. pipe	765 l. f.	2.35	2.35	2.65
11. 18 in. dia. pipe	750 l. f.	2.25	2.80	3.50
12. 21 in. dia. pipe	540 l. f.	3.80	3.15	4.15
13. Storm sewers, in place				
12 in. dia. pipe	530 l. f.	2.00	2.05	1.05
14. 14 in. dia. pipe	182 l. f.	2.60	2.20	1.55
15. 18 in. dia. pipe	225 l. f.	3.00	2.55	2.30
16. Manhole, in place	1	225.00	230.00	250.00
17. Inlets and headwalls				
Concrete	51 c. y.	50.00	74.25	50.00
18. Reinforcing steel	6,000 lb.	.15	.14	.10
19. Grates with frames	25 ea.	45.00	35.00	225.00
20. Raise inlet	1	40.00	44.00	50.00
21. Riprap or concrete	40 s. y.	6.00	11.00	3.75
22. Smoothing areas	5 acre	300.00	50.00	100.00
23. Liming, fertilizing and seeding				
Lime	120 ton	8.00	2.45	2.50
24. Fertilizer	24 ton	72.00	84.00	50.00
25. Seed—30 lbs. per acre	87 acre	45.00	37.00	44.00
26. Seed—60 lbs. per acre	31 acre	55.00	45.50	55.00
27. Cover crop—winter rye	acre	15.00	12.50	30.00
28. Sodding	750 s. y.	.60	.85	.35
29. Hay or straw mulch	60 ton	30.00	100.00	225.00
30. Fencing				
Class "C"	400 rod	7.00	5.50	4.50
31. Furnish 12 foot gate	2 ea.	30.00	30.00	30.00
32. Furnish and install monuments	10 ea.	25.00	22.00	30.00

NO WASTED MOTION,
LIQUID IS DRAWN IN HERE
AND PUMPED DIRECTLY OUT HERE
Strong, long-life construction. Made to stand up far beyond ordinary job requirements.
There's nothing complicated—no ports or valves to clog or jam.
Most efficient design—stationary diffuser within pump assures positive priming without recirculation or wasted motion.
Impeller alone moves the liquid.
Fitted with the finest mechanical seal. It is self-compensating for internal pump pressures.
No parts which require adjustment or manipulation. No parts to get out of order.
Positively self-cleaning. Needs no clean-out hole or plate
HOW MARLOW "WATER WIZARDS" ARE MADE TO ... PREVENT TROUBLE...

Marlow "Water Wizards" are original and different in design. They contain no ports, by-passes or other auxiliary devices that reduce efficiency and cause troubles. In these self-priming centrifugal pumps, there are no parts which require adjustment or manipulation. The impeller alone moves the liquid. Simple, efficient design prevents clogging, jamming or other problems.

Moreover, Marlow "Water Wizards" are constructed stronger than is necessary. They have an *extra margin of stamina*, which enables them to keep going dependably, even under extremely difficult conditions. No other pumps have such performance records.

You go a long way to prevent costly troubles on jobs when you use Marlow "Water Wizards". 1½ to 10-inch sizes — 3,000 to 240,000 gallons per hour. Send today for all the facts about these reliable pumps.

MARLOW PUMPS
RIDGEWOOD, NEW JERSEY
Manufacturers of the World's Largest Line of Construction Pumps

WAREHOUSES, RENTON, WASHINGTON

OWNER: U. S. Engineer Office, Seattle, Wash.

PROJECT: Construction of two frame warehouses, each 200 x 825-ft., at the plant of the Boeing Aircraft Co., Renton, Wash. Project involves construction of rail spurs, sanitary and storm sewers, paving, and water supply system. Warehouses are of wood frame construction with timber piling foundations.

CONDITIONS: Rail, highway and water transportation facilities available to project site. Contractor to complete work in 130 days. Wage rates are: skilled labor, $1.545 to $2.00 per hour; semi-skilled, $1.145 to $1.495; and common, $1.145.

BIDS: Six bids were received February 26, 1945, ranging from the contract low of $666,723 to $879,715.

LIST OF BIDDERS:

1. A. F. Mowat Constr. Co. and John H. Sellen Constr. Co., Seattle, Wash. (contract) $666,723
2. Sound Constr. & Engr. Co., Seattle, Wash. 696,141
3. Boespflug Constr. Co., Seattle, Wash. 728,595
4. A. W. Johnson Co., Seattle, Wash. 739,897
5. General Construction Co., Seattle, Wash. 771,972
6. George Teufel, Seattle, Wash. 879,715

Warehouse Structures

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing site	Lump Sum	$1,575.00	$3,000.00	$1,100.00
2. Break and remove concrete	1,700 s. y.	.63	.30	.60
3. Common excavation	20,300 c. y.	.55	.58	.82
4. Structural excavation	15,000 c. y.	1.32	.74	1.50
5. Imported pit run fill and bkfill. material	17,700 c. y.	.84	.80	.90
6. Crushed stone base course	16,000 ton	2.26	3.35	2.60
7. Structural concrete	1,730 c. y.	19.20	21.00	16.75
8. Furn. treated timber piling	300 l. f.	.75	1.15	.60
9. Drive timber piles	16 ea.	40.00	38.00	45.00
10. Warehouse and shed (wood trusses)	Lump Sum	336,027.00	336,559.00	368,897.00
11. Automatic sprinkler system	Lump Sum	53,392.15	53,412.00	53,025.00
12. Sprinkler supervisory alarm sys.	Lump Sum	20,620.00	20,620.00	21,798.00
13. Watch, report and fire alarm sys.	Lump Sum	6,262.00	6,259.00	6,616.00
14. Ext. electric work	Lump Sum	7,054.00	7,060.00	7,482.00
15. Fence, type FEN-C-M	2,003 l. f.	.74	.12	1.00
16. Relocate existing fence	695 l. f.	1.82	.23	1.90
17. Four-foot gate	1 ea.	22.00	12.00	80.00
18. 20-ft. gate	2 ea.	150.00	35.00	180.00
19. 56-ft. gate	1 ea.	600.00	90.00	630.00
20. Relocate one guard office	Lump Sum	600.00	420.00	996.00
Pavement				
21. Conc. paving slab outside bldg. (6-in. thickness; thickened edges)	18,700 s. y.	2.05	2.83	2.75
22. Prime coat, MC-2	7 ton	36.75	43.00	40.00
23. Plant-mix bitum. surfacing	1,900 ton	5.70	5.75	6.00
24. Asphalt cement in plant mix (121-150)	95 ton	30.00	30.00	31.00
25. Seal coat, RC-2	5 ton	35.00	38.00	40.00
26. Cover aggregate for seal coat	45 ton	4.00	3.80	4.00
Railroad				
27. Railroad track	5,125 l. f.	1.36	3.25	1.40
28. Turnouts	4 ea.	237.00	325.00	200.00
29. Double crossovers, incl. grade crossing planking	2 ea.	450.00	800.00	415.00
30. Ballast	550 ton	2.32	1.85	2.65
31. Williams St. grade crossing	Lump Sum	650.00	345.00	800.00
32. 8th Avenue grade crossing (incl. removing culvert)	Lump Sum	375.00	290.00	300.00
33. Grade crossing planking	1,800 l. f.	.75	.80	.11
34. Bumpers	4 ea.	30.00	4.00	35.00
Culverts				
35. 12-in. rein. concrete culv. pipe	27 l. f.	2.03	2.03	2.15
36. 12-in. ext. str. r. c. culv. pipe	162 l. f.	2.03	2.03	2.15
37. 18-in rein. conc. culv. pipe	141 l. f.	3.02	3.03	3.20
Water Supply System				
38. 8-in. cast iron watermain	4,500 l. f.	2.39	2.29	2.50
39. 6-in. cast iron watermain	1,000 l. f.	1.73	1.73	1.83
40. 4-in. cast iron watermain	180 l. f.	1.27	1.27	1.35
41. 2½-in. wr. iron or steel water line	40 l. f.	1.00	1.00	1.05
42. 2-in. as above	185 l. f.	.79	.80	.83
43. 1¼-in. as above	110 l. f.	.74	.74	.80
44. 8-in. gate valves and valve boxes	14 ea.	70.35	70.35	74.00
45. 8-in. gate valve with indicator post	8 ea.	115.50	115.50	122.00
46. 6-in. gate valve and valve boxes	3 ea.	48.30	48.30	51.00
47. 4-in. gate valve and valve boxes	6 ea.	34.65	34.65	36.00
48. 2½-in. gate valve and valve box	1 ea.	27.30	27.30	30.00
49. 2-in. gate valve and valve box	3 ea.	23.10	23.10	25.00
50. 1¼-in. gate valve and valve box	3 ea.	17.33	17.35	20.00
51. Fire hydrant	8 ea.	105.00	105.00	110.00
52. Relocate existing fire hydrant	1 ea.	26.25	26.25	30.00
53. Protective posts for hydrants and post indicator valves	36 ea.	6.30	6.30	6.60
Sanitary Sewer System				
54. 8-in. sanitary sewer pipe	2,000 l. f.	1.37	1.37	1.45
55. 6-in. sanitary sewer pipe	50 l. f.	1.08	1.08	1.14
56. Special pipe encasement under RR	40 l. f.	4.20	4.20	4.45
57. Sanitary sewer manholes (over 4-ft.)	4 ea.	105.00	105.00	110.00
58. Sanitary sewer shallow manholes (under 4-ft. depth)	9 ea.	89.25	89.25	94.00
Storm Drainage System				
59. 30-in. rein. concrete pipe	150 l. f.	6.06	6.06	6.40
60. 18-in. rein. concrete pipe	2,425 l. f.	3.02	3.02	3.20
61. 18-in. ext. str. rein. conc. pipe	890 l. f.	3.57	3.57	3.75
62. 12-in. ext. str. rein. conc. pipe	1,400 l. f.	1.87	1.87	1.98
63. 6-in. concrete pipe	2,840 l. f.	.92	.92	1.00
64. 8-in. open joint pipe	570 l. f.	1.10	1.10	1.15
65. 6-in. open joint pipe	1,410 l. f.	.92	.92	1.00
66. Paved drainage ditch, complete with parking bull rails	1,240 l. f.	.45	.70	.75
67. Plug two existing drainage pipes	2 ea.	10.50	10.50	15.00
68. Storm drainage manholes	15 ea.	105.00	105.00	111.00
69. Storm drainage inlet manholes	24 ea.	84.00	84.00	88.00
70. Type I inlets	18 ea.	52.50	52.50	55.00
71. Type II inlets	8 ea.	63.00	63.00	66.00
72. Type III inlets	2 ea.	68.25	68.25	70.00
73. Outfall structure, incl. pipe cradles	Lump Sum	315.00	68.25	300.00

DRAINAGE CONDUIT, EAST BOSTON, MASSACHUSETTS

OWNER: Commonwealth of Massachusetts, Department of Public Works, Waterways Division.

PROJECT: Construction of a reinforced concrete drainage conduit between Porter St. and Prescott St., East Boston, at the General Edward Lawrence Logan Airport. Alternate proposals were received for reinforced concrete box and for 84 in. reinforced concrete pipe. Main difference between base bid and alternate bid (listed below) was that base bid required 3,312 cu.yds. of concrete and 236,160 pounds of reinf. steel, while alternate required but 1,046 cu.yds. concrete and 104,920 pounds reinf. steel. Alternant also required 1,492 lin. ft. precast pipe and support.

BIDS: Twelve bids received Nov. 27, 1945, ranging from the contract low of $172,216 to high of $347,136. (Estimated cost, $296,402.)

LIST OF BIDDERS:

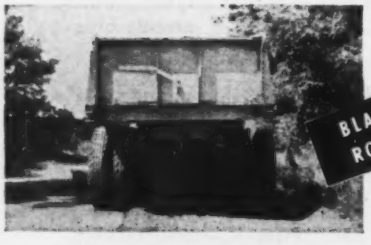
	Alternate
1. C & R Construction Co., Boston, Mass.	$172,216
2. A. D. Daddario, Boston, Mass.	214,614
3. E. M. Matz, Boston, Mass.	224,077
4. R. Zoppo, Roslindale, Mass.	227,540
5. Marson Construction Co., Somerville, Mass.	237,194
6. B. Perini & Sons, Framingham, Mass.	256,679
7. V. Barletta Co., Roslindale, Mass.	287,690
8. M. DeMatteo Construction Co., Quincy, Mass.	296,325
9. Angelo Grande, Norwood, Mass.	300,766
10. Coleman Bros., Boston, Mass.	312,132
11. Federico Construction Co., Dedham, Mass.	341,179
12. J. F. Fitsgerald Construction Co., Boston, Mass.	347,136

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Trench	14,280 cu. yds.	$1.50	$3.25	$3.00
2. Excavation below grade	250 cu. yds.	1.50	3.00	4.00
3. Unclassified excavation	1,000 cu. yds.	.75	2.00	3.00
4. Channel excavation	6,000 cu. yds.	.50	.50	1.50
5. Boulder excavation	25 cu. yds.	10.00	10.00	20.00
6. Foundation piles	28,200 lin. ft.	.50	.90	.75
7. Bulkhead piles	720 lin. ft.	2.00	3.00	2.50
8. Lumber left in place	125 M. b. m.	200.00	150.00	200.00
9. Screened gravel	1,400 tons	1.60	2.00	2.50
10. 10" underdrain	2,400 lin. ft.	.80	1.00	1.00
11. Ordinary borrow	26,000 cu. yds.	1.40	.75	1.00
12. Concrete	1,046 cu. yds.	12.50	15.00	18.00
13 Concrete heated	500 cu. yds.	12.75	15.00	20.00
14. Reinforcing steel	104,920 pounds	.047	.07	.08
15. Fastenings	2,600 pounds	.10	.30	.40
16. Manholes	10 each	200.00	150.00	200.00
16. 18" D. S. V. C. pipe stubs	8 each	10.00	15.00	8.00
18. Drilling holes	30 lin. ft.	3.00	1.00	4.00
19. Cutting slots	60 lin. ft.	3.00	1.00	6.00
20. Cleaning B. & A. R. R. drain	Lump Sum	1,000.00	6,000.00	1,500.00
21. Precast pipe and support	1,492 lin. ft.	20.00	35.00	22.00

FOUR-WHEEL-DRIVE

A "Plus" that Pays in Many Ways!

FWD ... THE *One* TRUCK FOR *Many* JOBS IN HIGHWAY CONSTRUCTION and MAINTENANCE



The all-purpose, all-season truck is **FWD** . . . the one truck that does many jobs . . . so dependable, rugged and economical that it has become first choice of highway construction and maintenance men who "know their highways."

FWD engineering is responsible for superior performance in road blading, new road construction or maintenance patrolling, earth moving, material hauling, pulling heavy equipment, snow clearing and other heavy-duty highway work. FWD engineering provides the highest development of the true four-wheel-drive principle with center differential . . . power and load distribution equalized . . . working-strains divided over two driving axles . . . driving power and traction on all wheels . . . ruggedness that stands the gaff of years of punishing highway duties of all sorts.

See your FWD dealer, or write for information on FWD Trucks now ready to go to work for you.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wisconsin

Canadian Factory: KITCHENER, ONTARIO

FWD TRUCKS

THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS

For 36 years owners have said: "FWD -- the Best Truck Built"

WOLF CREEK DAM
CUMBERLAND RIVER, KENTUCKY

OWNER: War Department, U. S. Engineers, Nashville, Tennessee.

PROJECT: The construction of Wolf Creek Dam, a combination concrete and earth dam located on the Cumberland River at mile 460.9 in Russell County, Kentucky, approximately 10 miles southwest of Jamestown, Kentucky, and 12 miles north of Albany, Kentucky. The site is served by right and left bank access roads connecting with highway No. 35 which runs through both Jamestown and Albany, Kentucky. Railroad facilities are available at Jamestown, Tennessee, (Oneida and Western Railroad) a distance of 42 miles and at Somerset, Kentucky (Southern Railway) which is about 52 miles from the site. The work for this project is authorized by the Flood Control Act approved June 28, 1938. Work includes: Cofferdams for earth embankment; masonry construction, unwatering, maintenance and removal; foundation work, excavation, foundation drilling and grouting; earth embankment, earth fill, stonework, drainage and roadway surfacing; concrete masonry for concrete dam, pylon, spillway bridge, spray, training and retaining walls, piers, powerhouse substructure and appurtenant works; penstocks, power and lighting systems, elevator, bulkheads.

CONDITIONS: Contractor to furnish all plant, materials, equipment and supplies, labor and transportation, including fuel, power, water (except some materials furnished by the Government) and to complete all work within 1,000 calendar days.

BIDS: Six bids were received at 11:00 AM, February 5, 1946, at Nashville, Tennessee ranging from the contract low of $18,395,934.50 to $23,722,071.00.

1. J. A. Jones Construction Company, Inc., Charlotte, N. C., and Wright Contracting Co., Columbus, Ga., a joint venture. (contract) $18,395,934.50
2. S. A. Healy and Company, and Material Service Corporation Chicago, Ill. $19,933,822.30
3. Wolf Creek Constructors, Dallas, Texas, a joint venture of ten firms. $20,386,386.00
4. Morrison-Knudson Co., Inc., Boise, Idaho $22,960,301.00
5. Wolf Creek Constructors, Kansas City, Missouri, a joint venture of five firms. $23,094,544.50
6. Foley Brothers, Inc., Pleasantville, New York $23,722,071.00

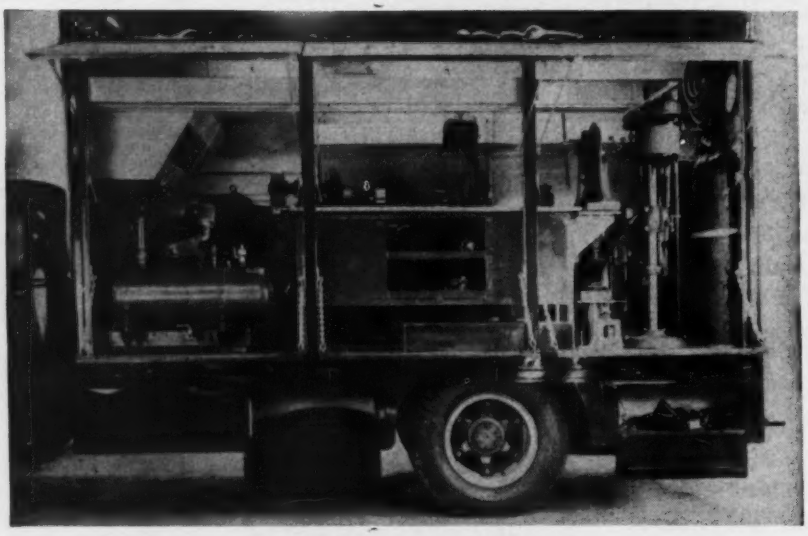
Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cofferdams	Job	$314,000.00	$320,000.00	$333,427.00
3. Excavation, Common	1,380,000 cu. yd.	.38	.59	.50
4. Excavation, Rock	158,000 cu. yd.	2.75	3.65	2.25
5. Line Drilling	15,000 sq. ft.	1.25	2.23	2.00
6. Excavation, Borrow Area "A"	3,500,000 cu. yd.	.334	.53	.38
7. Excavation, Borrow Area "B"	3,100,000 cu. yd.	.296	.51	.38
8. Excavation, Borrow Area "C"	1,150,000 cu. yd.	.409	.54	.40
9. Foundations, Cleanup	70,000 sq. yd.	1.50	1.57	2.00
10. Drilling 2" Grout Holes Under Embankment	300 lin. ft.	2.90	2.82	2.20
11. Drilling 2" Grout Holes Under Masonry	57,000 lin. ft.	2.90	2.96	2.20
12. Drilling 4" drain Holes	7,000 lin. ft.	4.70	4.75	3.35
13. Drilling 2" Drain Holes (Percussion)	1,950 lin. ft.	3.75	1.38	.70
14. Drilling 3" Anchor Holes (Percussion)	6,800 lin. ft.	3.75	1.38	.80
15. Drilling 6" Core Holes	200 lin. ft.	8.30	8.26	6.00
16. Pressure Grouting Under Embankment	100 sack of cmt.	1.20	1.38	1.10
17. Pressure Grouting Under Masonry	45,000 sack of cmt.	1.20	1.38	1.10
18. Impervious Rolled-Fill	6,900,000 cu. yd.	.058	.07	.14
19. Random Fill	232,000 cu. yd.	.03	.055	.10
20. Backfill	32,000 cu. yd.	.90	.69	1.40
Two Trips	2,000,000 sq. ft. (100 sq. ft.)	.012	.001	.03
23. Sand and Gravel	50,900 cu. yd.	2.16	.90	1.50
24. Riprap Dumped	150,600 cu. yd.	1.83	4.00	3.00
25. Rock Paving	4,500 cu. yd.	9.00	25.50	15.00
26. Rockfill	21,000 cu. yd.	3.50	4.80	2.40
28. Vitrified Tile, ½ Round 12"	3,200 lin. ft.	1.00	1.03	2.00
29. Seeding	46 Acre	400.00	645.00	350.00
30. Roadway Gage	22,000 sq. yd.	1.50	1.58	1.20
31. Roadway Guard Rail	9,200 lin. ft.	2.50	2.75	2.00
32. Corrugated Metal Pipe 10"	910 lin. ft.	3.00	3.45	3.00
33. Corrugated Metal Pipe 12"	580 lin. ft.	4.00	4.20	3.50
34. Corrugated Metal Pipe 15"	150 lin. ft.	5.00	5.00	4.50
35. Corrugated Metal Pipe 21"	1,970 lin. ft.	6.00	6.60	6.00
36. Corrugated Metal Pipe 24"	460 lin. ft.	8.00	7.60	7.00
37. Catchbasin, Complete	20 each	100.00	260.00	200.00
38. Hauling and Storing Cement	1,400,000 Bbl.	.40	.88	.60
39. Concrete, Dam	1,250,000 cu. yd.	7.42	6.10	7.50
40. Conc., Piers, Spray Walls	11,500 cu. yd.	15.30	13.55	22.00
41. Concrete, Training and Retaining Walls	36,400 cu. yd.	11.75	9.00	12.00
42. Concrete, Bridge	640 cu. yd.	51.50	36.50	55.00
43. Concrete, Miscellaneous	4,500 cu. yd.	38.50	49.00	55.00
44. Pylon	Job	42,600.00	46,800.00	50,000.00
45. Reinforcing Steel	2,400,000 lb.	.0775	.085	.09
46. Porous Concrete Pipe	38,000 lin. ft.	.785	.70	1.40
47. Copper Stops	31,000 lb.	.78	.70	.90
48. Slide Gates	Job	18,230.00	50,500.00	50,000.00
49. Oil Pumps and Piping Sys.	Job	35,600.00	18,000.00	33,000.00
50. Sluice Bulkhead and Pickup Beam	Job	3,000.00	3,450.00	4,000.00
51. Tainter Gate Emb. Metal	Job	23,200.00	81,000.00	70,000.00
52. Penstocks	1,610,000 lb.	.182	.21	.18
53. Structural Steel	795,000 lb.	.12	.12	.14
54. Miscellaneous Metal Work	295,000 lb.	.31	.26	.30
55. Cast Iron, Miscellaneous	85,000 lb.	.58	.41	.20
56. Wrought Iron, Miscellaneous	98,000 lb.	.38	.30	.30
57. Brass and Bronze, Misc.	2,200 lb.	1.00	.83	1.50
58. Handrailing	55,000 lb.	.42	.34	.25
59. Pipe, Black Steel	207,000 lb.	.20	.17	.15
60. Pipe, Misc. Corru. Metal	18,600 lb.	.16	.25	.20
61. Sump Pumping System	Job	6,800.00	7,600.00	4,500.00
62. Raw Water Supply System	Job	4,200.00	4,500.00	5,000.00
63. Grouting Gallery Water Sys.	Job	4,000.00	1,900.00	2,000.00
64. Bypass Systems	Job	20,000.00	27,500.00	20,000.00
65. Floatwell Piping System	Job	3,900.00	3,800.00	3,500.00
66. Pylon Plumb. and Drain. Sys.	Job	4,650.00	3,700.00	3,500.00
67. Piesometer System	Job	3,000.00	3,200.00	1,500.00
68. Elevator	Job	22,350.00	22,000.00	20,000.00
69. Trashrack Cleaning Pipe Sys.	Job	11,700.00	3,000.00	30,000.00
70. Power and Lighting System	Job	118,700.00	48,000.00	80,000.00
71. Conduit for Electric Wiring	Job	59,000.00	82,000.00	50,000.00
72. Tile Gages	Job	2,200.00	700.00	2,000.00
73. Tainter Gates	Job	70,300.00	90,000.00	70,000.00
74. Tainter Gate Oper. Mach.	Job	29,300.00	37,000.00	20,000.00
75. Intake Gates and Hoists	Job	28,500.00	60,000.00	35,000.00
76. Crushed Stone	1,700 cu. yd.	4.50	4.50	3.50

POWERHOUSE SUBSTRUCTURE ITEMS

1. Excavation, Common	23,000 cu. yd.	1.00	.50	.50
2. Excavation, Rock	36,500 cu. yd.	5.14	3.92	3.00
3. 6" Porous Conc. Pipe Half Rnd.	3,350 lin. ft.	.50	.55	1.50
4. Line Drilling	40,000 sq. ft.	1.25	2.23	2.00
5. Drilling 2" Grout Holes Under Masonry	2,000 lin. ft.	2.90	2.95	2.20
6. Pipe, Black Steel	20,500 lb.	.20	.17	.15
7. Press. Grout. Under Masonry	2,500 sack of cmt.	1.20	1.38	1.10
8. Drilling 3" Drain Holes	650 lin. ft.	3.75	1.38	3.20
9. Backfill	16,000 cu. yd.	.90	1.13	1.40
10. Concrete, Foundations	32,000 cu. yd.	14.30	10.16	13.00
11. Concrete, Walls	3,400 cu. yd.	32.00	33.48	42.00
12. Reinforcing Steel	1,900,000 lb.	.0775	.085	.09
13. Copper Water Stops	4,000 lb.	.80	.70	.90
14. Steel Water Stops	11,800 lb.	.10	.14	.50
15. Structural Steel	62,100 lb.	.12	.12	.14
16. Misc. Metal (Embedded)	23,000 lb.	.31	.26	.30
17. Steel Doors Embed. Metal	1,600 lb.	.25	.34	.30
18. Draft Tube Gates Embedded Metal	50,000 lb.	.07	.34	.20
19. Draft Tube Unwatering Sys. Piping and Embed. Metal	79,000 lb.	.35	.20	.14
20. Station Drainage System C.I. Pipe and Embed. Metal	118,000 lb.	.35	.20	.15
21. 8" Vitrified Clay Pipe B & S.	650 lin. ft.	1.40	.83	1.50
22. 3" Vitrified Clay Pipe B & S.	400 Lin. ft.	1.05	.62	1.00
23. Generator Cooling Water Sys. Piping, Embed. Metal	12,500 lb.	.38	.20	.20
24. Sewage Disp. System Piping	2,000 lb.	.38	.20	.20
25. Tailwater Gauge Piping	900 lb.	.40	.20	.20
26. Turbine Free Air Sup. Piping	8,200 lb.	.36	.30	.30
27. Hosing on Draft Tube Pier	12 each	300.00	345.00	250.00
28. Station Ground Grillage	310 lb.	1.00	.83	1.00
29. Embedded Elect. Mat.	3,050 lb.	.75	.83	1.00

New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS



Truck-Mounted Repair Shop

Production of a complete truck-mounted repair shop for use of contractors, utilities, oil companies, mines, railroads, street railway systems, and highway departments is announced. Suitable for mounting on any standard long wheelbase truck, the shop assembly contains virtually every item of equipment needed for mechanical repair and maintenance work. Its use tends to eliminate the costly practice of hauling broken-down machines to central shops for repairs and to result in time and labor savings.—*Davey Compressor Co., Kent, Ohio.*

Measuring Radiation

It is claimed that a new calculating device, a round dial with three concentric celluloid printed discs, eliminates the figuring usually necessary to determine the amount of heat radiation.

The dial shows sizes of mains, returns, risers, radiator sizes and capacities, round and sectional boiler net ratings, chimney flue sizes and capacities with minimum and maximum heights, hot water tank sizes and capacities, fuel oil tank sizes and capacities, hot water generator capacities and other heating information.—*Heat-O-Meter, 424 West 42nd Street, New York 18, N. Y.*

• • •

Triple Roll Crusher

Said to do the work of two crushers, a new unit has three rolls equipped with manganese steel shells, with the extra roll mounted over the stationary roll in such position that the rock is fed into the opening between the top and stationary roll, passing between the stationary roll and the horizontal floating roll. The third roll assembly can be shipped from the factory complete with all attachments for use on existing Pioneer roll crushers. The new crusher is available at present in two sizes—54x24 in. and 40x22 in.—*Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.*

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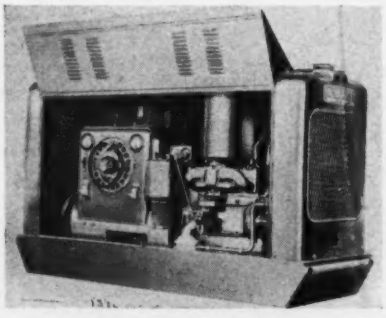

Engine-Driven Welder

Enclosed in a compact steel canopy with hinged side panels and powered with a 26 hp. 4 cylinder engine, a new "Simplified" arc welder has a range of 40 to 275 amperes. Voltage and amperage adjustments to fine degrees are provided through a multi-range dual control of welding current. With 10 ranges of current and 100 steps of volt-ampere adjustment in each range, 1,000 combinations are available for any desired arc.

This engine-driven unit includes remote control for use with an ordinary extension cord, and a mercury-type idling device.—*The Hobart Brothers Co., Troy, Ohio.*

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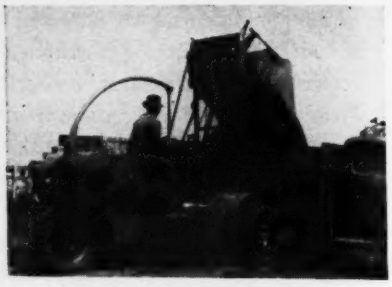
Scoopmobile

This front end loader is designed and built as a complete unit. The driving power and traction are at the front. The steering gear is at the rear. The rear wheel is a single wheel, thus making the machine extremely maneuverable. There



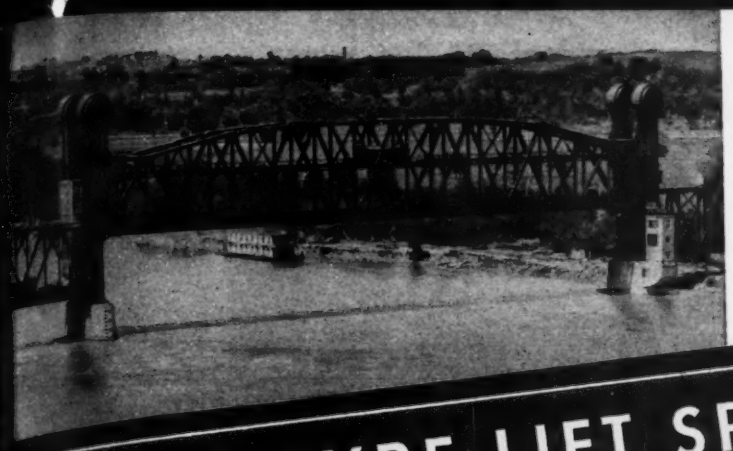
is also a line of attachments, easily interchangeable with the scoop, so that in one machine can be a loader, a dozer, lifting machine, powered concrete buggy, lumber handler, or a hoisting boom.—*Mixermobile Co., Inc., 608 South Hill Street, Los Angeles 14, Calif.*

• • •

Crane Gage

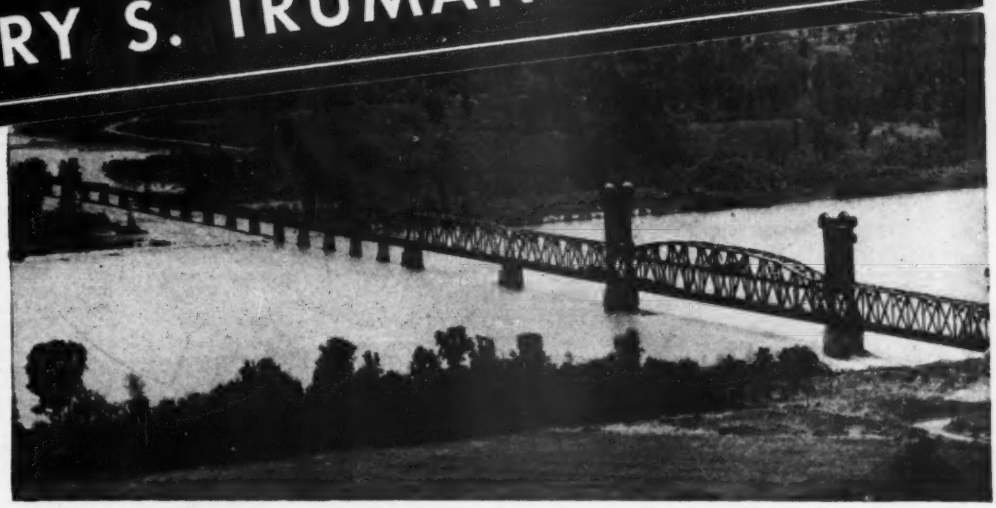
Enabling an operator to see at a glance if the load weight is within the safe limit of the boom radius, the new Clyde crane gage may be attached to any crane. It functions during the raising or lowering of the boom, with a load suspended in the tackle. If the boom radius exceeds the safe load limit, it is immediately indicated in red on the gage dial.

The weighing unit is suspended from the boom end, taking the place of the



The 1,600-ton, 420-foot long vertical lift span in its raised position provides a channel width of 400 feet and a vertical clearance above low water of 70 feet for navigation. In its closed position the normal clearance above low water is 34 feet, so that the total movement of the span is 36 feet. The three story operating house may be seen on the right-hand pier.

NEW TYPE LIFT SPAN FEATURES HARRY S. TRUMAN BRIDGE



The bridge consists of three 250-ft. through truss spans, one 420-ft. through truss vertical lift span, 18 deck plate girder spans of 78 feet and one plate girder span of 45 feet. It was designed and the construction supervised by Howard, Needles, Tammen & Bergendoff, consulting engineers.

THE HARRY S. TRUMAN BRIDGE crossing the Missouri River at Kansas City, Mo., is the major element of an outstanding railroad relocation project. Undertaken jointly by the Chicago, Milwaukee, St. Paul & Pacific Railroad Company and the Chicago, Rock Island & Pacific Railway Company, it provides a more direct routing of rail traffic through Kansas City, and permits faster-scheduled operations for war transport to West Coast ports.

This imposing bridge, first opened to traffic on June 1, 1945, is a single track structure with a total length of 2,633 feet. Its dominating 420-foot vertical lift span over the navigation channel is electrically operated by remote control from a 3-story operating house located on one of the end piers. A gasoline power unit is available for emergency operation in case of electrical power failure.

The unusual features and engineering developments which are embodied in the design and construction of the Harry S. Truman Bridge, contribute to the lasting strength and ruggedness demanded by today's and tomorrow's heavy freight tonnage, great traffic density, and high speed operations.

The completed ready-for-traffic superstructure—including all structural steel; sheaves, ropes, counterweights, machinery, electrical equipment and housings for operating the lift span; laying of ties, tracks, footwalks and railing for the completed railway deck—was under contract to American Bridge Company.

War projects such as this point the way to the postwar problems facing America's railroads — for "better railroading" is here to stay. And when their postwar plans of roadbed rehabilitation shape up, American Bridge will be prepared to meet their every structural need.

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• All day comfort is realized through its light weight (just over an ounce), rolled edges and shape that fits facial contours. The adjustable headband holds the goggle snug without pressure. Two nose sizes assure proper fit.

• Overall eye protection because of large lens firmly anchored in frame but easily replaceable. Resists impact equal to steel ball traveling at 225 ft. per sec. Adequate protection for chipping, grinding, spot welding, etc.

• Available in standard and extra large sizes; curved and flat lens styles; clear or Willson Tru-Hue* green plastic; ventilated or non-ventilated; clear, frosted or green frame. Can be worn over prescription spectacles with comfort.

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For help on your eye-protection problems, get in touch with your Willson Distributor or write for information. *REG. U. S. PAT. OFF.

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PRODUCTS INCORPORATED

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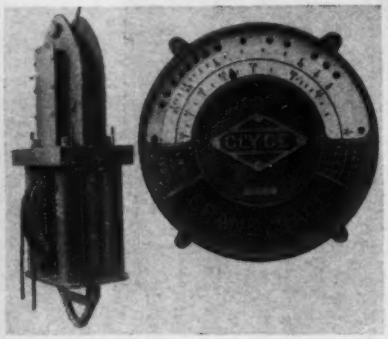
upper load block. Through spring action and in conjunction with a series of collector rings, lights are actuated behind the dial in the operator's cab. Intercon-



nected with the crane boom, the dial registers the radius at which the boom is set, and the lights indicate through the red or green portion of the dial if the load to be hoisted is within safe limits for that particular radius.—*Clyde Iron Works, Inc., 836 East 136th St., New York, N. Y.*

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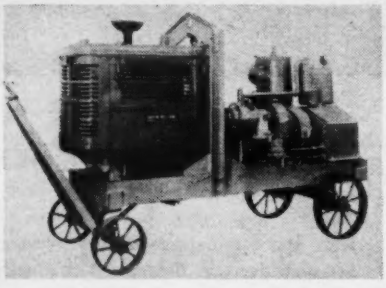
Wellpoint Pump

Due to increased horsepower, an addition to the line of Griffin wellpoint equipment—Model 108-D, 10 x 8, Vac-U-Matic wellpoint pump—delivers 2,800



gpm. In addition to diesel power and larger capacity, this pump incorporates many mechanical improvements, it is stated, including elimination of all packing in the stuffing box.—*Griffin Wellpoint Corp., 881 East 141st St., New York 54, N. Y.*

• • •

Check Valve

Operation of this valve is effected by a synthetic rubber tube, stretched over a slotted, cup-shaped metal core, which expands to open and contracts to close. Due to the fact that this expansible tube closes instantly on balanced flow, prior to the commencement of back flow, there is never any tendency to establish pressure impulses, shock or water hammer through the flow line. The flexible tube possesses a uniform and constant spring rate which avoids inertia being set up to

(*Continued on page* 218)

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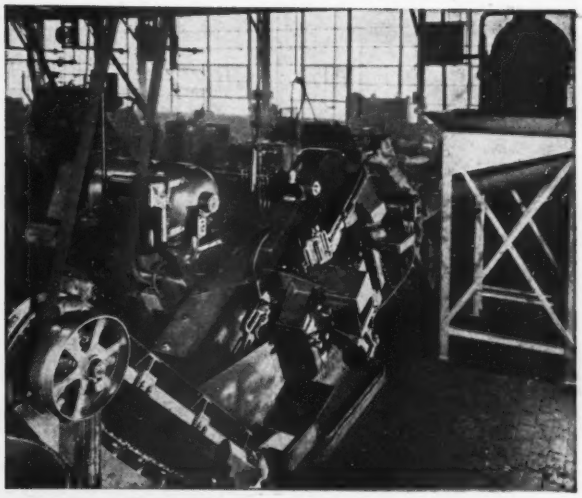
MAINE...Portland—Maine Truck-Tractor Co.
MD...Baltimore—Phillips Machinery & Tractor Co.
MASS...Newton Upper Falls—United Equip. Corp.
MICH...Bark River—Bark River Culvert & Equipment Co.
Detroit and Grand Rapids—
Wolverine Tractor & Equipment Co.
MINN...Minneapolis & Duluth—Roahat Equipment Co.
MISS...Jackson—Mississippi Road Supply Co.
MO...St. Louis—Missouri-Illinois Tractor & Equip. Co.
Kansas City—Noel V. Wood, Inc.
MONT...Billings & Missoula—Industrial Equipment Co.
NEB...Omaha—Nebraska Tractor & Equipment Company
North Platte—Cornhusker Tractor & Equip. Co.
NEV...Reno—Brown Motors
N. H...Manchester—R. C. Hazelton Co.
N. J...Trenton—Ross, Young, Dilts Company
N. M...Albuquerque—Hardin & Coggins
N. Y...Buffalo—Dow & Company, Inc.
Brooklyn—Edward Ehrbar, Inc.
Long Island—George Malvese & Co.
Albany, Syracuse—Milton-Hale Mach. Co.
N. C...Raleigh—J. B. Hunt & Sons
N. D...Fargo—Myhra Equipment Company
OHIO...Cleveland—Gibson-Stewart Company
Cincinnati—Rish Equipment Co.
Cambridge—Major Equipment Co.
OKLA...Tulsa & Guthrie—C. L. Boyd Company, Inc.
ORE...Portland & Eugene—Howard-Cooper Corporation
PA...Butler—National Equipment Co.
Pittsburgh—Atlas Equipment Corp.
Philadelphia—Service Supply Corp.
Harrisburg & Wilkes-Barre (Kingston)—
State Equipment Co.
R. I...Providence—Tractors, Inc.
S. C...Columbia—N. H. Summers Road Machinery Co.
S. D...Sioux Falls, Rapid City—Empire Equipment Company
TENN...Knoxville & Chattanooga—Brooks Equip. & Mfg. Co.
Nashville—Industrial Tractor & Equipment Co., Inc.
Memphis—Road Builders Equipment Co.
TEXAS...Dallas & Houston—Browning-Ferris Machinery Co.
San Antonio—Jess McNeel Machinery Co.
Plainview & Sweetwater—Plains Mach. Co.
El Paso—Hardin and Coggins
UTAH...Salt Lake City—The Lang Company
VA...Richmond—Municipal Sales Company
Richmond and Roanoke—Rish Equipment Co.
Alexandria—Phillips Mach. & Tractor Co.
WASH...Seattle—Howard-Cooper Corp.
Spokane—Intermountain Equip. Co.
W. VA...Charleston and Clarksburg—Rish Equipment Co.
WIS...Eau Claire—Bark River Culvert & Equipment Co.

SEE Adams AD ON OPPOSITE PAGE

HIGH SPEED HEADING — 11,220 pieces an hour is the rate of this ¾" header.

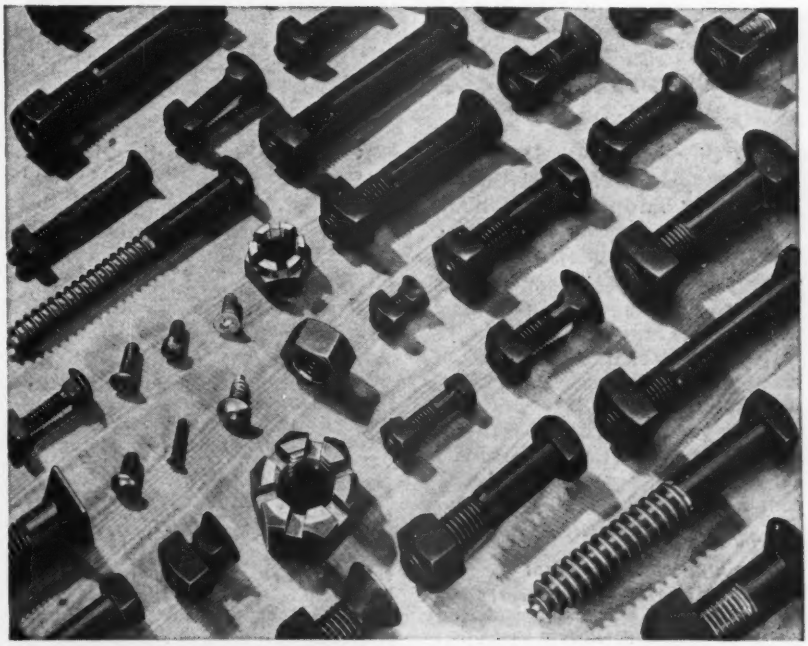


THREADING ACCURACY — RB&W cold forms threads in the widest size range — for maximum strength and precision.

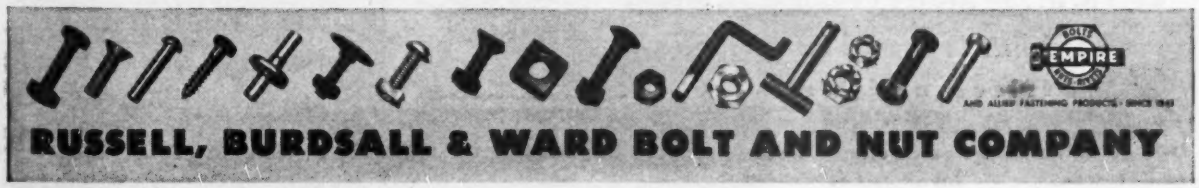
RB&W The complete quality line

The most modern machinery, the use of cold-forming methods for heading and threading, the finest equipped laboratories for analysis of raw materials, and a quality control system that involves continuous inspection *at the machines* . . . assure highest quality and perfect uniformity of RB&W Machine Bolts. These are characteristics which you, as the user, can translate into faster assembly, greater holding power and better appearance.

Whatever your requirements may be in bolts, nuts, screws, rivets and special fasteners, RB&W is your logical source of supply . . . offering the advantages of a 101-year old experience and unsurpassed research and production facilities to provide you with *engineered* fasteners of maximum strength and accuracy and finest finish.



101 YEARS *Making strong the things that make America strong*



Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill. *Sales Offices:* Philadelphia, Detroit, Chicago, Chattanooga, Los Angeles, Portland, Seattle. *Distributors* from coast to coast. By ordering through your distributor you can get prompt service for your normal needs from his stocks. Also, the industry's most complete, easiest-to-use catalog.

Esco 1½ yard All-Cast dipper on Thew-Lorain "77" on Woodland-Martins Bluff job. Contractor: Leonard & Slate, Portland, Oregon.

ESCO DIPPER BUCKETS

...dig faster...last longer!

ESCO dipper buckets don't need to be pampered. Whether they're working in hardpan, gravel, boulders or rock, they do a full day's work, take abuse in stride.

This was proved to contractors Leonard & Slate recently on their Woodland - Martins Bluff highway job in Washington state. On this job 2-1/3 miles of 4-lane highway required the excavation of 665,000 yards of rocky, root-infested earth. Says Contractor Fred H. Slate, *"Our operators found that Esco buckets dig fast, stand the gaff, require little attention."*

Esco dipper buckets give:

1. *Faster Digging*—more passes per hour. This is due to clean cutting front with integral tooth bases, and to flaring outside teeth which give clean, full bite. Tapered box allows quick, complete load discharge.
2. *Lighter Weight*—Use of strong, shock-proof manganese steel and hollow arch construction reduces weight without sacrificing strength. Less bucket weight, more payload per pass.
3. *Longer Life*—Esco design assures distribution of strain uniformly throughout the bucket. Parts subjected to wear and shock are made of manganese steel, reinforced.

ESCO makes two types of dipper buckets—the Cast-Welded for general purpose work and the All-Cast bucket for extremely hard service. They are fully illustrated and described in Esco bulletins 156 and 114B respectively. Get your copies from your nearest Esco representative or write us direct.

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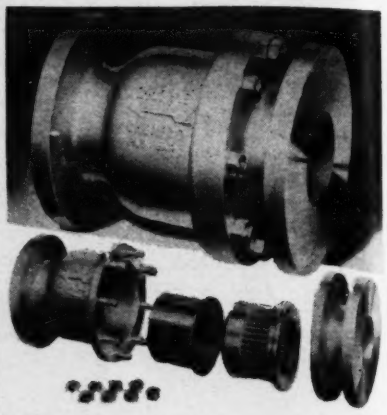
IN CANADA— ESCO LIMITED, 1084 Homer St., Vancouver, B. C. Telephone Marine 2343

cause operation beyond flow requirements. Because of its self-compensating



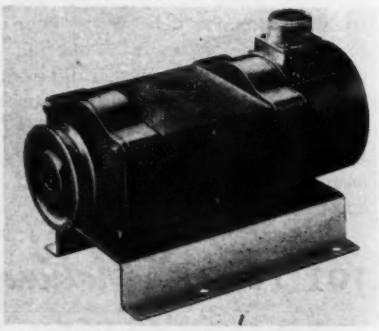
and wear resistant factors this unit is particularly suited for handling even the most highly corrosive and erosive air, gases or liquids.—*Grove Regulator Co., 6510 Green Street at 65th, Oakland 8, Calif.*

• •

Convertible Excavator

Constructed for equal effectiveness as a shovel, dragline, crane or clamshell, a new 1½-yd. model has a number of operating refinements. As a dragline there are big working ranges with a new mast-type suspension; the shovel has a strong but light boom with large diameter point sheaves and a high lip all welded dipper; the crane offers long booms with jib extensions, 2-clutch-operated independent boom hoist with full, accurate power control of raising and lowering, and optional independent 2-speed propulsion.—*Bucyrus-Erie Co., So. Milwaukee, Wis.*

• • •



Light-Weight Generator

A generator weighing only 20 to 25 lb. is available in 500, 600, and 1,200-watt capacities, at 32 and 120 volts. Originally developed as an airborne unit, it can be supplied as a two-bearing unit, or with a single bearing for direct-drive application.—*Electrical Engineering & Mfg. Corp., 4606 W. Jefferson Blvd., Los Angeles 16, Calif.*

AGGREGATES AWEIGH — AND AWAY — *Fast!*

KEEPING up with a dual drum paver plus a 27E from the same batcher is high production by anyone's standard. It's no stunt performance but a regular day-in, day-out procedure for a Butler Weigh Batcher equipped with Selective Beam Control.

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High production, however, is only one talent;—in Butler Weigh Batchers any production demand, no matter how quick-stepping, is always coupled with absolute accuracy.

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Such production requirements are not those of tomorrow;—they are here now. The contractors who will build the gigantic airfields to handle the planes of today which attain almost the speed of sound, the contractors who will lay the great highways already at the construction stage,—are the contractors who are BUTLER equipped.

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To study in detail the reasons why Butler Weigh Batchers offer more in instant control, faster production, split-hair accuracy and years of dependability,—write for Bulletin 150E.

3 *Types of* **CORE BITS**

Each of the three types of JKS core bits is designed to operate at high efficiency and low cost.

Use HI-CASTE core bits for drilling in hard, fine-grained, solid formations.

Use HARDHED core bits for drilling in broken, irregular or coarse abrasive formations.

Use FERRET bits for drilling in extremely hard formations where whole stone bits polish rapidly or for drilling in weathered, broken or very abrasive ground. The Ferret bit, a self-sharpening impregnated bit, requires no resetting.

Consult JKS engineers on selection of core bits and other diamond drilling problems.

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Elections and Activities

At the recent annual meeting of the Boston, Mass., Society of Civil Engineers, George A. Sampson, partner of Weston & Sampson, consulting engineers, was elected president. Mr. Sampson was graduated from Dartmouth College, 1901, and from the Thayer School of Engineering, 1903. He was assistant in civil and hydraulic engineering at Massachusetts Institute of Technology 1903-1904, and later entered the United States Reclamation Service. He engaged in private practice in Boston from 1910 to date and in 1921-1922 was in charge of the hydraulic and sanitary engineering course at M. I. T. Mr. Sampson is past president of the New England Water Works Association.

Other officers elected are: Frederic N. Weaver, professor of civil engineering, Tufts, vice-president; Everett N. Hutchins, district waterways engineer, State Department of Public Works, secretary; Chester J. Ginder, senior civil engineer, Metropolitan District Water Supply Commission, treasurer; Frank L. Flood, Metcalf & Eddy, and Prof. Donald W. Taylor, M. I. T., directors.

M. L. Hoffman, chairman of the Minnesota Highway commission, has been elected president of the American Association of State Highway Officials.

Officers of the Harrisburg, Pa., chapter of the National Society of Professional Engineers are: Guy R. Johnson, president, J. Donald Carpenter, vice president, Charles E. Parry, secretary, Herbert K. Dodge, treasurer, and George B. Bains, III, Kenneth H. Caskey and Benj. A. Johnson directors.

C. C. Lindsay, Montreal, has been elected president of the Canadian Institute of Surveying. A. O. Gorman, Ottawa, was elected first vice-president and J. H. Ramsey, Fredericton, N. B., second vice-president. W. L. McIlquham, Ottawa, continues as secretary-treasurer.

The Puget Sound Council of Engineering and Technical Societies at Seattle, Wash., has elected R. E. Kistler chairman for 1946. A. L. Miller will serve as vice-chairman, L. B. Cooper as secretary, B. A. Travis as treasurer and the following as council representatives: R. Erwin, T. B. Carroll, W. S. McCrea, F. H. Rhodes, F. M. Veatch, H. T. Griffith, I. B. Cooper, R. A. Ashleman, A. R. Wilson, J. K. Pierce, E. D. Engle and Eugene Dawson.

Six members of the Seattle chapter have been presented with certificates of life membership in the American Society of Civil Engineers. They are W. Chester Morse, superintendent of the Seattle Water Department; William D. Shannon and Robert Howes, consulting engineers; Nathaniel A. Carle, engineer, Puget Sound Bridge & Dredging Co.; L. M. Grant, sales engineer, West Coast Wood Preserving Co., and O. P. M. Goss, president of the Goss Engineering Co., Research engineers.

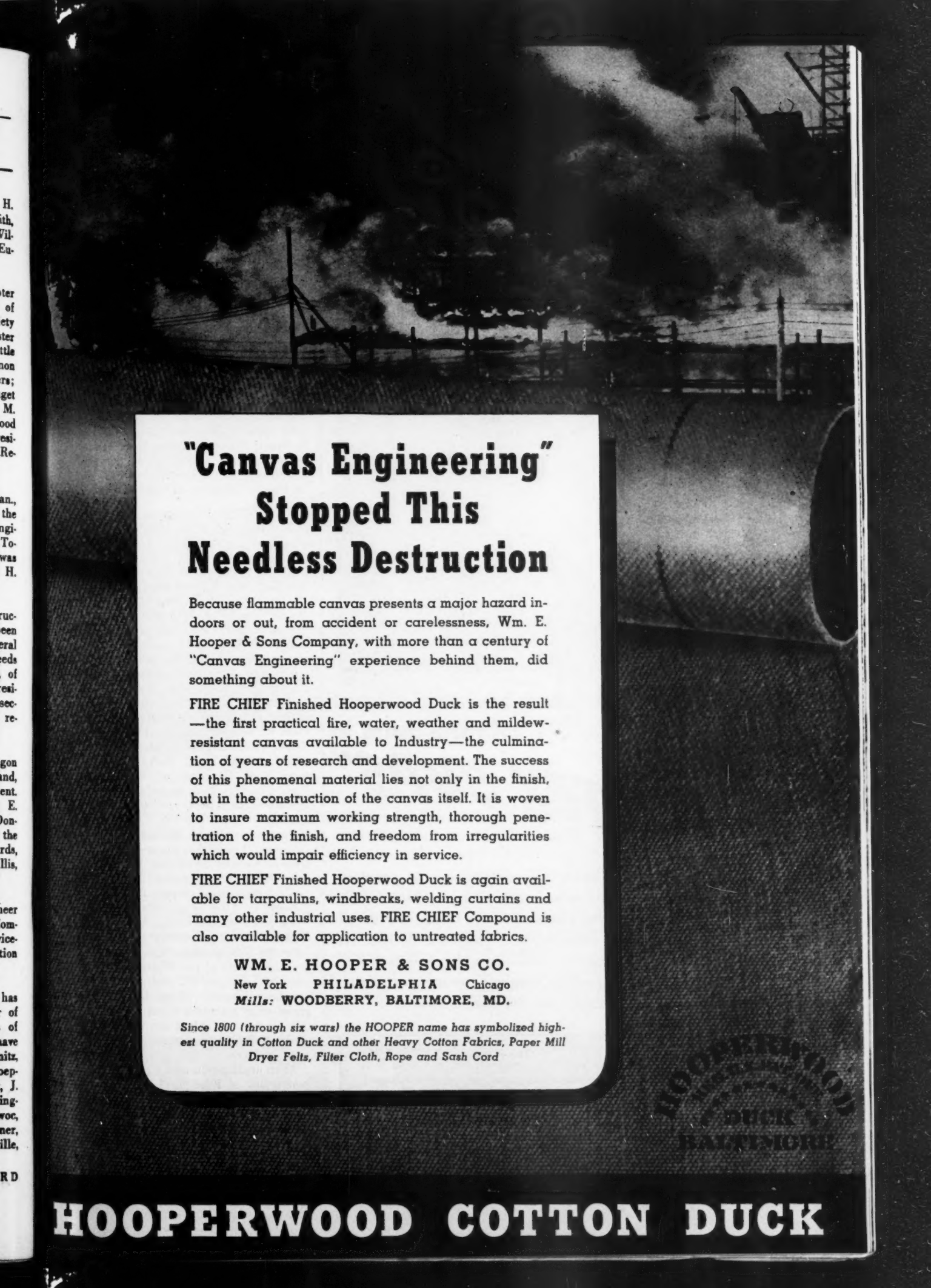
Maloy L. Quinn of Clay Center, Kan., was recently elected president of the Kansas Society of Professional Engineers. He succeeds D. F. Joslin of Topeka. C. Y. Thomas of Pittsburg, was elected vice-president, and Harold H. Munger, of Manhattan, secretary.

Norman Cloke, of the Cloke Construction Company Ltd., Toronto, has been elected president of the Ontario General Contractors Association. He succeeds W. J. Bradford, Charles Robertson, of Brantford, was elected first vice-president, and C. E. Potter, of Toronto, second vice-president. Norman Fraser remains as secretary-manager.

The Professional Engineers of Oregon have elected Ben E. Torpen of Portland, Corps of Army Engineers, president. Other officers elected are Charles E. Canada, Portland, vice president; J. Donald Kreeker, Portland, trustee for the metropolitan area; Carl P. Richards, Salem, and George G. Gleeson, Corvallis, trustees at large.

Harry B. Henderlite, chief engineer of the Louisiana State Highway Commission, has been elected regional vice-president of the American Association of State Highway Officials.

The Wisconsin Constructors, Inc., has merged with the Wisconsin chapter of the Associated General Contractors of America and the following officers have been elected: President, Nic. J. Schmitz, Madison; vice president, Edward Hoepner, Eau Claire; secretary-treasurer, J. Harry Green; directors, L. E. Cunningham, Beloit, Orville Breuer, Manitowoc, R. W. Kivell, Oshkosh, Edward Hoepner, Eau Claire, Mark A. Cullen, Janesville,



"Canvas Engineering" Stopped This Needless Destruction

Because flammable canvas presents a major hazard indoors or out, from accident or carelessness, Wm. E. Hooper & Sons Company, with more than a century of "Canvas Engineering" experience behind them, did something about it.

FIRE CHIEF Finished Hooperwood Duck is the result —the first practical fire, water, weather and mildew-resistant canvas available to Industry—the culmination of years of research and development. The success of this phenomenal material lies not only in the finish, but in the construction of the canvas itself. It is woven to insure maximum working strength, thorough penetration of the finish, and freedom from irregularities which would impair efficiency in service.

FIRE CHIEF Finished Hooperwood Duck is again available for tarpaulins, windbreaks, welding curtains and many other industrial uses. FIRE CHIEF Compound is also available for application to untreated fabrics.

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"nix on the old bucket and tin dipper . . . I'll take mine in VORTEX CUPS"

DIXIE'S PORTABLE WATER CARRIER

And that's taking the modern way of guarding against mouth-carried infections, mister. Dixie's Portable Water Carrier belongs to the new era of surrounding workmen with protective devices. Its individual Dixie or Vortex Cups help keep men well and working—help maintain your construction schedules. *Write for descriptive booklet.*

EFFICIENCY HINT: The more yearly water intake offsets sweat loss by men doing manual labor, the better their performance, as shown in report by Harvard University Fatigue Laboratory. Free copy on request.

DIXIE CUPS, VORTEX AND PAC-KUP CONTAINERS ARE MADE AT EASTON, PA., CHICAGO, ILL., DARLINGTON, S. C., TORONTO, CANADA

Nic. J. Schmitz, Madison.

The Nova Scotia Association of Professional Engineers, has elected J. L. Cavanaugh, New Glasgow, president. Named to the vice-presidency was A. E. Flynn, Halifax. The councillors are: S. G. Naish, Sydney, L. D. Hopkins, Bridgewater; and H. Fellows and I. P. Macnab, Halifax. The retiring president was J. R. Kaye, Halifax.

About 100 educators from Utah, Nevada and California met at the University of California recently for the first meeting since before the war of the Southwest Section of the Society for the Promotion of Engineering Education. Dean M. P. O'Brien of the University of California, College of Engineering, addressed the section on problems of engineering schools in the postwar period. Officers elected are: chairman, A. G. Gehrig, Pasadena Junior College; vice chairman, E. L. Grant, Leland Stanford University; and Secretary-treasurer, E. D. Howe, University of California.

Linus H. Frost of Saginaw has been elected president of the Michigan Association of County Drain Commissioners.

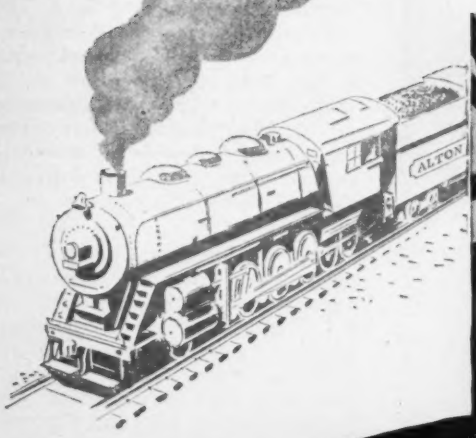
The Sanitary Engineering and Public Health Research Council of Texas has set up its permanent organization. The council was initiated by the universities and colleges of Texas interested in research in the sanitary engineering and public health fields, the objectives being to promote research and to facilitate the transfer of information in these fields, and also to obtain funds for such research. Officers for the coming year are: Dean W. R. Woolrich of the University of Texas, chairman; Dean O. V. Adams, vice-chairman; E. E. McAdams, secretary; J. K. G. Silvey of North Texas State Teachers College and V. M. Ehlers, members of the executive committee.

The newly-formed Mississippi Scenic Highway Association, representing 19 Illinois counties bordering the Mississippi River, has approved the association's incorporation papers and bylaws. Edward P. Allen is president.

To promote construction of a scenic highway, which eventually will stretch from the Gulf of Mexico to Canada on the Illinois side of the Mississippi is the organization's purpose, and a resolution has been adopted asking Illinois congressmen to introduce a bill authorizing this construction, plans for which were dropped during the war.

At an organization meeting of building contractors in Fond du Lac, Wis., the following officrs were elected: President, Louis J. Andrews; vice-president, Wm. J. Born, Jr.; and Eugene L. Clement, Secretary-treasurer.

Train Smoke Spelled TROUBLE for the Alton & Southern



... Now ALCOA ALUMINUM is on the job

The locomotive house trusses you see in the photograph above are brand-new replacements of Alcoa Aluminum—another case where the corrosion resistance of Alcoa Aluminum solves a construction problem . . .

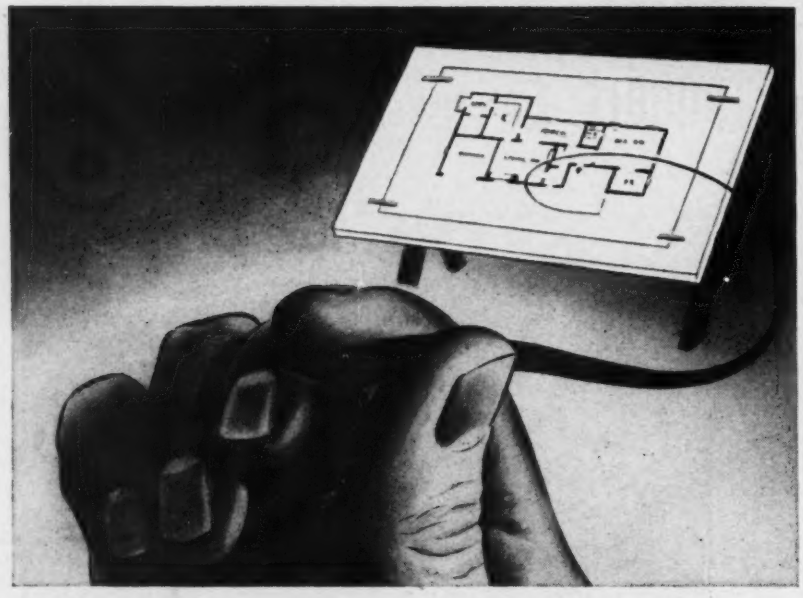
For it took only twelve years for corrosive engine smoke to damage the previous steel trusses to a point where they demanded replacement. Alton & Southern decided to replace with structural members that would *last* under the severe conditions imposed by heat, moisture, and sulfur gases.

Corrosion resistance is only one of the advantages of Alcoa Aluminum for heavy construction. Members are light in weight, easier to handle. Easy to fabricate. Strong, with all the strength that Alcoa Research has built into the big family of Alcoa Aluminum Alloys.

Stock structural shapes are available from your nearby Alcoa distributor. Consult our nearest sales office, or write:

ALUMINUM COMPANY OF AMERICA, 2108 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM



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that build Tracing Cloth Preference

If you could pick up a line freshly inked on Arkwright Tracing Cloth, you'd *see* your preference. Your line retains its edge and doesn't go flat or "mushy". It prints like a taut wire, even re-inked over heavy or repeated erasures.

This evenness and crispness of line, coupled with the unusual transparency of Arkwright Cloths, assures contrasty, easy-to-read prints . . . and the transparency is permanent. It is obtained by special mechanical processing. Arkwright Cloths do not cloud up nor become brittle with age, because no surface oils at all are used.

Want a treat? Send for working sample. Rule lines. Notice how they flow on evenly. Erase. Hold up to light and see if you can see the markings of a ghost. You'll then have a real preference. Arkwright Finishing Co., Providence, R. I.

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TRACING CLOTHS

AMERICA'S STANDARD FOR OVER 20 YEARS

Men and Jobs

I. Alvin Pasarew, director of the Maryland State Planning Commission, has been appointed to a technical committee of the Patapasco River Valley Commission. Others named on the committee are **Thomas F. Hubbard,** member of the Baltimore Commission on City Plan; **Walter C. Munroe,** chief engineer of the Anne Arundel County sanitary commission; **G. Douglas Andrews,** chief engineer of the metropolitan district, and **Joseph F. Kaylor,** State forester.

Roger Peabody, for the last six years in executive charge of all operation of the southwestern office of James Stewart & Co., Inc., Dallas, Tex., including the $30,000,000 North American Aviation plant, has resigned as vice-president to form his own building company, Peabody & Windrow, Inc. Mr. Windrow is an engineering graduate of Texas A. & M. College and the son of the late Rollin J. Windrow, former professor of engineering at that college.

John L. Drew and **Earl C. Peters** have formed the firm of Drew and Peters at Buffalo, N. Y. It is a technical and consulting organization to engage in planning aviation developments. It is made up of former key men of the Curtiss-Wright Corp. business research staff.

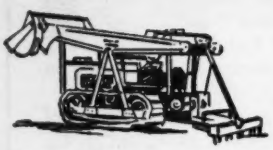
Brig. Gen. Thomas F. Farrell, chief field engineer of the N. Y. State Department of Public Works, has assigned **George Dyke** of his staff as resident engineer in charge of temporary housing construction in Rochester to supervise the work that will be done by A. Friedrichs & Son, general contractors, in re-erecting 300 housing units for veterans. The units are to be brought from Niagara Falls and Lewiston.

Ralph D. Brown, in addition to his position as Salius County highway superintendent, at Harrisburg, Ill., has been made acting superintendent of highways at Shawneetown, Ill. for Gallatin County.

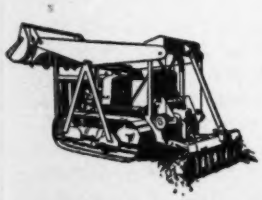
Appointment of **Max Bookman,** of Stockton, Calif., as district engineer of the Riverside County, Calif., Flood Control and Water Conservation district, was approved March 6 by the district's commissioners. Formal appointment by the County Board of Supervisors is anticipated. Mr. Bookman was formerly with the U. S. Geological and U. S. Geodetic surveys, and the California division of water resources in the office of the U. S. Bureau of Reclamation engineers.

McCAFFREY TRACTOR SHOVEL

WITH RUD-O-MATIC CONTROL



Ripper in operation. Tube bar connects ripper and walking beam arm of shovel. No bolts or pins required.



Blade attached to ripper shown in preceding sketch converts it to pullgrader.

FIVE JOBS BY ONE MACHINE

Digs, Grades, Rips, Lifts, Loads

COMBINES WORK OF LOADER, RIPPER, BULLDOZER, PULLGRADER, AND CRANE.

ONLY ONE MACHINE TO MOVE WHEN CHANGING JOB LOCATIONS.

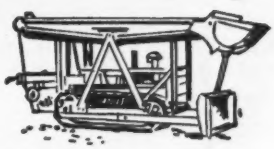
LOW OVER-ALL HEIGHT FOR TRANSPORTING.

WEIGHT CENTERED ON TRACTOR FRAME.

BUCKET CAN REACH OVER CENTER OF TRUCK BEING LOADED.

100% CABLE CONTROL OF BUCKET PERMITS GRADUAL DUMPING OF THE LOAD.

MPM



Bulldozer ready for action.

Used as a crane.

Manufactured in sizes, ¾ yard to 1¾ yards. Photo above shows 1¼ yards capacity.

M. P. McCAFFREY, INC.

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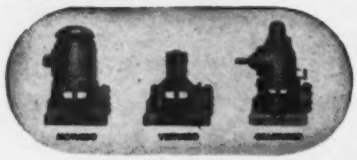
The Time is Approaching When You Can Again Get a *PEERLESS*

• Like thousands of others, you've probably put a new water pump at the top of your *must* list of improvements. *"Will I be able to get a Peerless?"* you ask. The answer is sounding more cheerful every day. *Yes, you will,* in the not too distant future. The big Peerless back-log of orders is being worked on 24 hours a day. The situation improves daily. But don't wait to place your order until your need becomes desperate. Consult with the nearest Peerless Distributor now and get your order on file. We'll do everything within our power to deliver your needed pump as soon as we can. Certain types can be delivered sooner than other models—so check with Peerless now.



THE PEERLESS LINE IS MOST COMPLETE

Deep Well Turbine Pumps, Vertical Types, Oil or Water Lubricated, Capacities: 15 to 30,000 g.p.m.

Horizontal Centrifugal Pumps For General Service, Solid, Volute, and Split-Case Types, Capacities: 2 to 70,000 g.p.m.

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PEERLESS PUMPS

VERTICAL & HORIZONTAL

PEERLESS PUMP DIVISION

Food Machinery Corporation

Los Angeles 31, Calif. Canton 6, Ohio

Quincy, Ill.

District Engineer Officers

Appointment of **Eugene I. Pease** as head of the engineering division, Seattle, District, U. S. Army Engineers, has been announced by Col. Conrad P. Hardy, district engineer.

A veteran of 34 years of engineering experience on Pacific Northwest and Alaska waterway projects, Pease since 1928 has served the district in executive capacities connected with comprehensive surveys of regional water resources, improvement of waterways and harbors and projects for flood control. He first went to work for the district in 1910 as a part-time surveyor while still an engineering student at the University of Washington.

Col. John S.. Seybold, district engineer of the Syracuse, N. Y., district, has received the Legion of Merit for "exceptionally meritorious conduct in the performance of outstanding services while assigned to duty in the Office, Chief of Engineers, from September, 1939, to April 1943." Colonel Seybold has already been awarded the Bronze Star Medal for his work with the Army Engineers in the E.T.O. from April, 1943, to September, 1945.

Col. Wilson B. Higgins, C.E. US.M.A., 1920, has been district engineer of the Savannah, Ga. engineer district since September, 1945, when he returned from Germany, where, with the Engineer Section of the Advance Section Communications Zone, he was chief of the Railroads Division for eleven months.

Maj. Gen. Lewis A. Pick, who recently succeeded Brig. Gen. R. C. Crawford, as Missouri River division engineer at Omaha, Neb., has been named chairman of the Missouri River interagency committee. The committee is made up of representatives of various states and federal agencies interested in the Army Engineer-Bureau of Reclamation plans for flood control navigation, power production and irrigation projects in the Missouri River basin.

Brig. Gen. William W. Wannamaker, of Wakefield, Mass. has been appointed Missouri River division deputy engineer under Maj. Gen. Lewis A. Pick, at Omaha, Mr. Wannamaker is a West Point graduate.

Edmund C. Garthe has been transferred from the New York office, District 1, of the U. S. Public Health Service, where he was district engineer, to a similar position in the Chicago office, District 3. He replaces **Col. L. M. Fisher,** sanitary engineer director, transferred to the sanitary engineering division in Washington, and is replaced in New York by **Lt. Col. V. B. Lamoureux,** recently returned from duty in Egypt and Italy.

Col. O. E. Walsh has been named district engineer for the Portland district, succeeding **Col. G. J. Zimmerman,** who becomes executive officer. Colonel Walsh was graduated from the U. S. Military Academy in 1918, served in the Army overseas in World War I and was in the Army of Occupation in Germany.

Attached to the office of the Chief of Engineers at Washington, D. C., from 1927 to 1929, he was assigned to duty in China and the Philippines until he returned to the United States to serve at Kansas City, Mo., from 1931 to 1936, the last three years as district engineer.

He was called for duty overseas in February, 1943, serving with the Sixth Army as assistant engineer. He received the Legion of Merit Award for reconnaissance with an engineering unit prior to the landings on Woodlark and Kirvivian islands, northwest of New Guinea, ahead of the Sixth army assault troops.

As head of an engineer construction brigade, he participated in the Leyte and Luzon operations and was in charge of all heavy construction and engineering for the Luzon operations. He was awarded the Bronze Star for rapid construction of a railroad from Lingayen Gulf to Manila.

of any other pressure pipe material, practicable for underground mains, that will serve for a century?

Flanged Joint—for water, steam, oil or gas lines, generally used above ground.

Serves for Centuries

800 RPM *Reciprocating Action* FOR FLAT SCREENING

— yet the Red Elastic Collar protects permanently against VIBRATION

Vibration — set up by an 800 rpm eccentric drive with a 1" throw — made every bolted connection a trouble spot on the Symons Type F Screens. Other conventional fasteners failed on the full floating drive, screening and balancing decks and 'grizzly'. ESNA Elastic Stop Nuts held permanently! — just as they have held permanently against vibration on other equipment for fifteen years.

ESNA Elastic Stop Nuts are self-locking, easily removable, and reusable over and over. They protect permanently against Vibration, Corrosion, Thread Damage, Liquid Seepage and Costly Maintenance.

Here's a challenge: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts — FREE, in experimental quantities. For further information or literature address: Elastic Stop Nut Corporation of America, Union, New Jersey. Representatives and Agents are located in principal cities.

The RED ELASTIC COLLAR

—denoting an ESNA product

. . . is threadless and permanently elastic. Every bolt — *regardless of commercial tolerances* — impresses (does not cut) its full thread contact in the Red Elastic Collar to fully grip the bolt threads. In addition, this threading action properly seats the metal threads — and eliminates all axial play between bolt and nut threads.

All ESNA Elastic Stop Nuts — *regardless of size or type* — lock in position anywhere on a bolt or stud. Vibration, impact or stress reversal cannot disturb prestressed or positioned settings.

ESNA TRADE MARK

ELASTIC STOP NUTS

INTERNAL WRENCHING · ANCHOR · INSTRUMENT MOUNTING · SPLINE · CLINCH · GANG CHANNEL

PRODUCTS OF: **ELASTIC STOP NUT CORPORATION OF AMERICA**

Civilian Activity

Lieut. Col. George B. Sowers, Corps of Engineers, has returned to the practice of civil engineering after three years service in the Military Government section of the Army. He spent two years organizing and operating both civilian and military highway transportation units in North Africa and Italy, having gone through the entire Italian campaigns with the Fifth Army. Later he was transferred to Korea where he was in command of similar work for the XXIV Corps. He has been appointed chief engineer and general manager of the Drilled-In Caisson Corp., which is the deep foundation subsidiary of Spencer, White & Prentiss, Inc., and the Western Foundation Co., in New York, Chicago and Cleveland.

Lieut. Col. Sowers, prior to his entering the Army, was a consulting civil engineer of Cleveland, Ohio, specializing in foundation and harbor work and was formerly chief engineer of the city of Cleveland. He is a graduate civil engineer from Case School of Applied Science; a member of the American Society of Civil Engineers, the American Road Builders Association, and of National Port & Harbor Association.

Claude W. Hamlin, Red Oak, Iowa, who recently received his discharge from the U.S.N.R. after serving in the South Pacific, has been appointed county engineer of Clark County, Iowa.

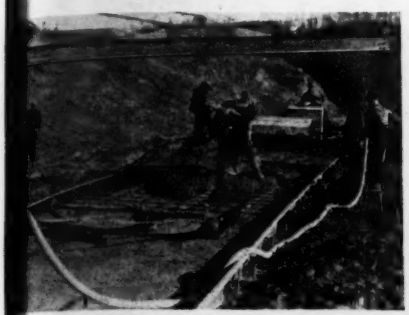
Bov Summerside, Redfield, S. D., has become resident engineer for the state highway department. He recently returned from Okinawa where he was with the Seabees. He also served in Alaska.

Arthur Ledbetter has been named city engineer for Corinth, Miss. He was graduated from Mississippi State College of Engineering in 1940, and served in the United States Army four years.

Fred Pfaff, Sigourney, Iowa, has been appointed county engineer of Jefferson County, Iowa, with headquarters at Fairfield. He succeeded **John Stout,** who resigned after ten years of service. Plaff was assistant engineer for Keokuk County for six years before entering the service.

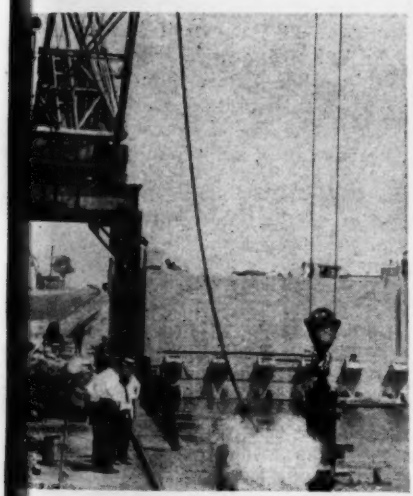
ontractors, · Quarriers, · Miners
Prefer MODERN, WELL-BALANCED Condor HOSE

hattan makes a completely engineered line of hose that has consistently helped to lower s and speed up schedules. Development of Condor hose constructions has kept pace with ancing methods of operation for more than half a century and today, as always, the dor line sets the standard for rubber hose. Three factors that make Condor hose "the better " are (1) FLEXLASTICS—Manhattan's own rubber compounds, (2) STRENGTH MEMBERS — ial construction features, (3) MANUFACTURE and DESIGN — 53 years of high standards.



ndor HOMO-FLEX WATER HOSE gives exceptional e on rugged road work where hose is constantly twisted and ged over rough ground, rocks, stakes, etc. Safe at working ures of 150 to 350 lbs. per square inch according to diameter.

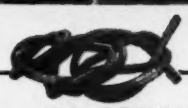
ndor HOMO-FLEX AIR HOSE—Freedom from kink- Lighter, easier to pull in long lengths. Resists the gouging and ion of jagged rock and stands the hammering pressure of an ill. Men like "easy-to-handle" Homo-Flex.



ndor PILE DRIVER STEAM HOSE has driven the piles hold some of the largest structures. Contractors prefer Condor use it is always up to standards of safety and long life.

ondor HOMO-FLEX SUCTION HOSE non-metallic re- ced, for safety in mines and for general service. Returns to inal shape if crushed.

ondor SAND SUCTION HOSE for heavy duty sand suc- and dredging. Engineered to resist collapsing under suction discharge pressures.



10 ADVANTAGES
OF HOMO-FLEX HOSE

1. Extreme flexibility—easy to handle
2. Resists kinking
3. Light in weight
4. Practically inseparable cover and plies—balanced homogeneous construction
5. Withstands high pressures and surges with wide margin of safety
6. Uniform inside diameter
7. Less elongation and expansion
8. Less fatigue to operator
9. More production
10. Lower ultimate cost

Condor HOMO-FLEX HOSE

Developed by Manhattan engineers to fill a need for a lighter, more flexible, streamlined hose that would last longer than conventional type hose. New Homo-Flex construction withstands destructive pulsations of pressure. Turnate Vulcanization makes an inseparable and uniform nose wall. In services where frequent handling and high pressures break down heavier hose, men are enthusiastic for Homo-Flex, the modern streamlined hose.

FLEXLASTICS is an exclusive Manhattan trade mark. Only Manhattan can make FLEXLASTICS.

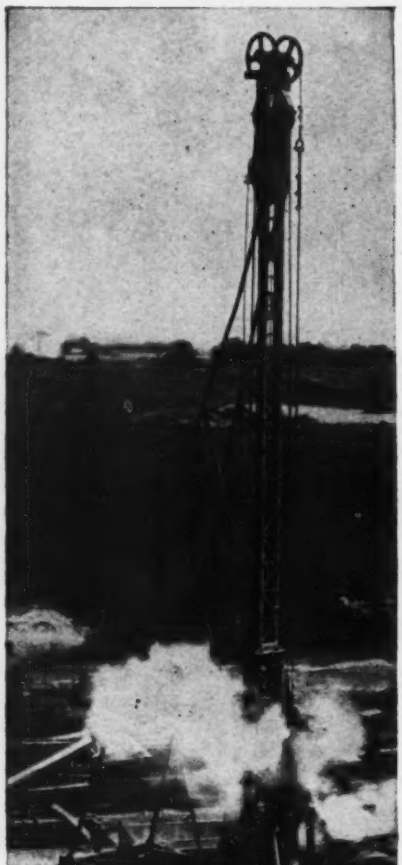
RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION

EXECUTIVE OFFICES AND FACTORIES PASSAIC, NEW JERSEY

Any Soil-Any Depth...

DRILLED-IN CAISSONS* DO THE JOB



When designs for heavy construction work go on the drawing board, it pays to consider the economy and time-saving features of Drilled-In Caissons*.

FOR HEAVY JOBS

Through all kinds of soil and to any depth, these caissons see the job through. They are "at home" under the heaviest bridges, buildings and viaducts.

Drilled-In Caissons of ARMCO Spiral Welded Foundation Pipe make for straight driving with least time and effort. They are known for their strength and watertightness all the way down to bedrock.

10 TO 36 INCHES

You'll find it well worth your time to look into the many features of these caissons. ARMCO Foundation Pipe diameters range from 10 to 36 inches, wall thicknesses from 3/16 to ½-inch. You can specify any length (not random) that can be handled and shipped. Write Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 2355 Curtis St., Middletown, Ohio.

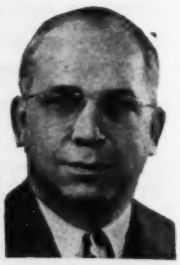
*Patented by the Drilled-In Caisson Corp., of New York and Chicago.

ARMCO

ARMCO FOUNDATION PIPE

Appoint Gordon Rieley to OPA building staff

Gordon Rieley, vice president of the Bryant Heater Co., has been appointed director of the newly established building and construction price division of the Office of Price Administration. The new division, which is being formed as part of the building materials division of OPA's industrial materials division, will work to assure maximum and early cooperation with the National Housing programs by concentration on bottleneck and price supply programs.



Mr. Rieley, a specialist in market research and analytical phases of sales and production, has been associated with the Bryant Heater Co. for the last 12 years.

Thomas J. Rodhouse has joined the engineering staff of the Iowa Steel & Iron Works at Cedar Rapids, Iowa. For the last 13½ years he has been with the Corps of Engineers as a civilian engineer, stationed for three years in the St. Louis, Mo., district, and for the last ten years in the Rock Island district, where he worked on the 9-ft. channel project on the Upper Mississippi River and later carried out assignments on war construction and production of military supply.

Frank Poduska, Sr., formerly chief estimator of the Amsterdam Building Co., is now connected with the Mutual Construction Corp., 7 East 42d Street, New York City.

Charles Bonfield, Middletown, has resigned as division engineer in the Ohio Highway Department's Division 8, to return to private industry. **Robert E. Gray,** Dayton, has been appointed assistant to the highway department's chief engineer. He will be assigned to Division 8.

Arthur E. W. Dodds, civil engineer, has joined the staff of Young & Richardson, Seattle architects and engineers. A graduate of the University of Washington, he has been chief engineer for the Weyerhaeuser Sales Co. in Tacoma for the last four years. Specializing in design and fabrication of heavy timber structures.

Eduardo Miery Teran, of Caracas, has been named director of public works for Venezuela. He succeeds **Luis Lander.** The new director has had personal charge of the building of the new $30,000,000 University center in Caracas.

SPECIALS!

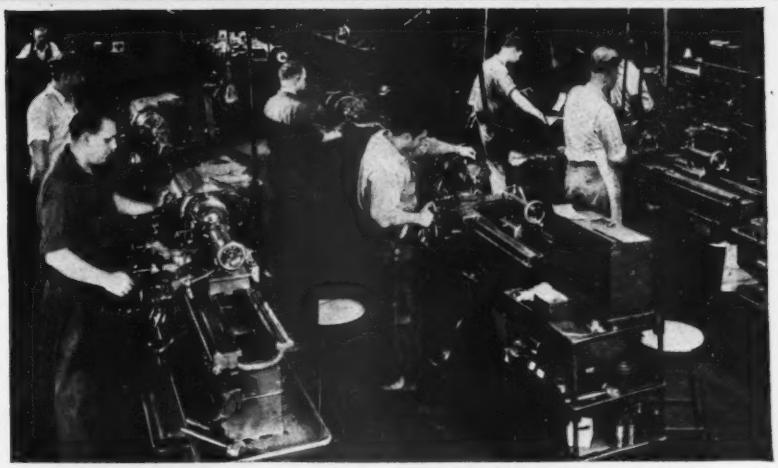
. . . convincing evidence of manufacturing skill

The complexity of modern, manufactured items reflects itself in the increasing demands for special type nuts and bolts. The unusual bolt illustrated, for example, is a vital part of the compressor unit of a national brand refrigerator.

Years of experience plus the fact that all circle B fasteners are controlled from billet to bolt in one single plant—*the largest independent in the country*—naturally make the Buffalo Bolt Company the logical starting point for any producer with a nut or bolt problem.

Whether they are standard or special, all circle B products have the same uniform, controlled quality that serves to make your production more efficient . . . your products more salable.

Did You Know that we have our own large machine shop where dies are carefully made by our own skilled toolmakers



BUFFALO BOLT COMPANY

NORTH TONAWANDA, N. Y. • SALES OFFICES IN PRINCIPAL CITIES

Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

Any Soil-Any Depth...

DRILLED-IN CAISSONS* DO THE JOB

When designs for heavy construction work go on the drawing board, it pays to consider the economy and time-saving features of Drilled-In Caissons*.

FOR HEAVY JOBS

Through all kinds of soil and to any depth, these caissons see the job through. They are "at home" under the heaviest bridges, buildings and viaducts.

Drilled-In Caissons of ARMCO Spiral Welded Foundation Pipe make for straight driving with least time and effort. They are known for their strength and watertightness all the way down to bedrock.

10 TO 36 INCHES

You'll find it well worth your time to look i
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*Patented by
New York an

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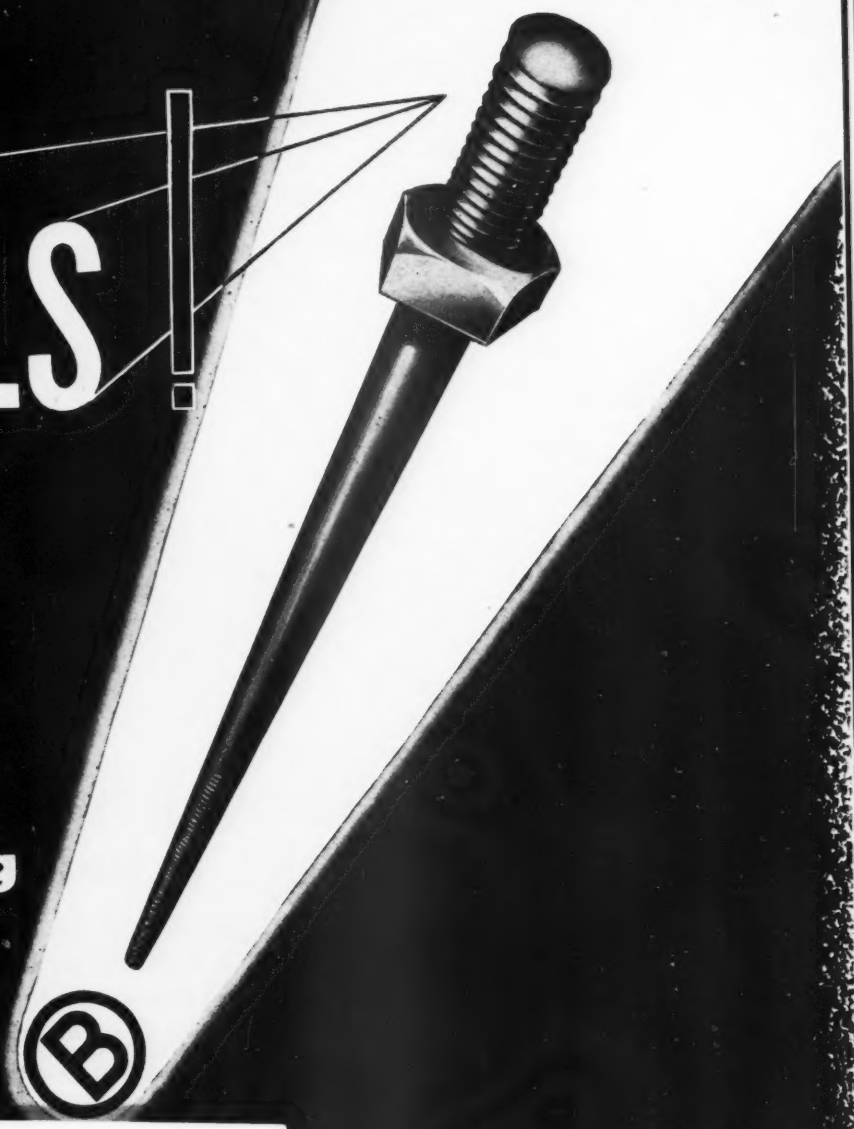
SPECIALS!



. . . convincing evidence of manufacturing skill

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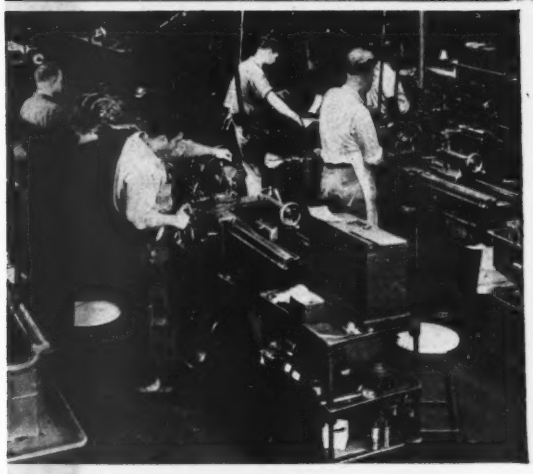


COMPANY

OFFICES IN PRINCIPAL CITIES

p., 50 Church Street, New York City

Both are good . . . but ONE is better!

TWO THOROUGHBREDS, nip and tuck most of the race . . . then, one pounds down the home stretch to win the purse by a length. Little differences in stamina, heart and training make the *big* difference between a consistent winner and a runner-up.

ROCHESTER WIRE ROPES are "consistent winners" on the job . . . because they're engineered to be not "just as good," but better . . . in performance, wear and safety.

EXTRA VALUE, demonstrated by extra performance, is built in by the Rochester "4-M" formula . . . (1) the best materials available . . . (2) the most efficient machinery . . . (3) modern methods of straightline production . . . and (4) men who are specialists in every step of wire rope fabrication . . . which assures an unsurpassed product! . . . Now all types, sizes, grades and constructions—preformed or standard—are available for immediate shipment.

LOCKED-IN LUBRICATION is forced by air pressure between individual wires. This process requires twice as much lubricant as is absorbed by other methods . . . protects against internal friction caused by rope passing over sheaves . . . assures longer life and better service from wire ropes made by Rochester.

ROCHESTER *Ropes*

CULPEPER, VIRGINIA

Rochester Ropes' engineers can advise you on your special problems of wire rope selection, use and maintenance. Inquiries invited.

Manufacturers' Activities

JOHN E. CRANE has been transferred from the advertising department of Joseph T. Ryerson & Co. to the advertising division of Inland Steel Co. He will continue as an assistant to Keith J. Evans who is advertising manager of both companies. Mr. Crane, recently captain of Combat Engineers, entered service in 1940, after having been in advertising in the Chicago area. He was with Meyer-Both Advertising Service, Advertising Publications, Inc., and was editor and advertising manager of The La Grange Shopping News in La Grange, Ill.

THE N. D. CUMMER & SON CO., of Cleveland, Ohio, manufacturers of asphalt plants and dryers, has opened a branch office at 101 Park Ave., New York City, under the direction of M. B. Preeman, secretary.

THE HERCULES POWDER CO. has announced the retirement of W. T. Ayer of the company's engineering department after 27 years of service.

THE APPOINTMENT of Harvey A. Craig as Pacific Coast manager for the Republic Steel Corp. has been announced by J. M. Schlendorf, vice president in charge of sales.

THE FORT PITT BRIDGE WORKS, Pittsburgh, Pa., has announced the appointment of A. D. Graves as district manager of their Cleveland territory. His headquarters will be at the Bulkley Building, Cleveland, Ohio.

HARRY F. VAN WAGNER formerly assistant sales manager for the Universal Atlas Cement Co., is now assistant sales manager of the Glens Falls Portland Cement Co., Glens Falls, N. Y.

THE CHICAGO BRIDGE & IRON CO. has reopened its sales office in Detroit, Mich., in the Lafayette Building. Edward D. Barrett, formerly of the Chicago office, is in charge.

E. T. TULLER has been appointed domestic sales manager for Athey Products Corp. Mr. Tuller joined the company in

1940 as a special representative in the introduction of the force-feed loader to the distributors' sales organization.

WALTER W. WALB has been elected to succeed his father, the late Clyde A. Walb, as president of the American Steel Dredge Co., Fort Wayne, Ind. He will continue to serve as general manager.

THE DELAVAL STEAM TURBINE CO., Trenton, N. J., has announced the appointment of H. H. Barrows and his organization—the Industrial Equipment Co. —as sales representatives throughout the lower Michigan peninsula for the IMO Pump and Worm Gear Division.

E. A. DANIELS and E. O. Williams have been elected recently to the post of vice presidents of Victor Equipment Co., San Francisco, Calif. Mr. Daniels, was formerly sales manager and Mr. Williams was formerly district manager with offices in Los Angeles.

J. G. CURRY has been appointed assistant sales manager of the Structural Products Division, Wickwire Spencer Steel, which is under the direction of Gordon L. Crawford, with general sales offices in Buffalo, N. Y. Mr. Curry will make his headquarters there.

HEWITT RUBBER CORP. has appointed Southworth Machine Co. of Portland as Maine distributor for industrial hose, conveyor belts and transmission belts. Southworth which recently expanded into the equipment sales field and completed a $100,000 building, has acquired distributorships for tractors and road machinery, power shovels and cranes, compressors, wire rope and rock crushers. The company carries a large parts stock and maintains a service department in Portland.

SAUERMAN BROS., INC., Chicago, manufacturers of scrapers and cableway equipment, has announced these new distributor appointments: Intermountain Equipment Co., Boise, Idaho; Robison Machinery Co., Salt Lake City, Utah; Highway Equipment Co., Cincinnati, Ohio; Jeff Hunt Machinery Co., Columbia, S. C.; and Constructors Equipment Co., Denver, Colo.

ACQUISITION of the McCook, Ill., government sheet mill by the Reynolds Metals Co. will speed the conversion of large quantities of aluminum battle scrap to meet immediate building needs, R. S. Reynolds, company president reports. Newly developed housing applications for the light metal coupled with its lower price and availability make this action of the War Assets Corporation an important step in accelerating building schedules

Electropumps

. . . for High Pumping Efficiency for all classes of general service

HERE'S a new centrifugal pump that has so many more-advanced developments in hydraulic design that the result is a new high in pumping efficiency—well in excess of 80% for pumps as small as 2½". The new Carver Electropumps are especially effective on high suction lifts, performing efficiently over their entire capacity range when operated under a dynamic suction lift of 15 feet and even more.

Designed by "field-experienced" engineers and built of finest quality material in every detail by skilled workmen, Electropumps are truly the biggest pump value today. For better service, greater dependability and higher pumping efficiency specify and buy Carver Electropumps. Available in capacities from 40 to 900 G.P.M. and heads up to 200 feet. Send for Bulletin No. 200 for complete details.

CARVER PUMP COMPANY

MUSCATINE, IOWA

Leupold Builder's Level

for

Engineers

Architects

Contractors

L&S

You'll search a long time to find an instrument comparable to this Leupold product. Men who use it confirm our belief that all requirements are conveniently incorporated in this one accurate, moderately priced level.

Telescope is external focusing, 13 inches long, with 1¼ inch objective; achromatic lens with a flat field and magnification of 18 diameters . . . Horizontal circle for turning angles and two auxiliary standards to which the telescope may be shifted for plumbing vertical lines . . . Instrument weight—8 lbs. Tripod weight—7 lbs . . . Hardwood carrying case.

Use coupon for literature

LEUPOLD & STEVENS INSTRUMENTS

Manufacturers since 1907

PORTLAND 13, OREGON

Surveying • Hydrographic • Navigation
Automatic Controls

Leupold & Stevens Instruments
4445 N. E. Glisan St., Portland 13, Oregon
Please send literature on Leupold Builder's Level

Name _____

Organization _____

Title _____

Street _____

City _____ *Zone* _____ *State* _____

and expediting the solution of the national housing emergency, in Mr. Reynolds' opinion.

THE APPOINTMENT of Edgar P. Hollister as manager of the New York factory branch was recently announced by J. F. Ray, director of sales, General Controls Co., Glendale, Calif. Mr. Hollister will devote his entire time to serving users of automatic pressure, temperature and flow controls in New York, New Jersey and Connecticut. He was formerly associated with the Bendix Aviation Corp.

HAMILTON VENEER CO., a subsidiary of United States Plywood Corp., has purchased the Southeastern Veneer Co., of Denmark, S. C., which operates a hardwood veneer cutting plant. Its facilities will be used primarily to furnish centers and crossbands for United States Plywood's Algoma, Wis. operation.

KOEHRING, Kwik-Mix, Parsons and C. S. Johnson customers in the Houston, Tex., area are now being served by the F. S. Ray Co., Houston. F. S. Ray has been selling construction equipment for more than 20 years, having been with the Hug Co. for 14 years, and with the Koehring Co. for 6 years. His company handles shovels, cranes and draglines, pavers, longitudinal finishers, dumptors, construction mixers and mud-jacks; concrete mixers, bituminous mixers and plaster-mortar mixers; trench-liners, bins and patchers, clamshell buckets, central mix plants, porto-batchers, and cement storage equipment.

ARTHUR J. OLSON, heretofore district sales engineer for Link-Belt Co. at Chicago, has been appointed district sales manager at Kansas City, Mo., to succeed Max Giffey, who has resigned after 40 years' service. For the past 20 years Mr. Olson has handled the engineering and sales of elevating, conveying, materials handling and power transmission machinery.

W. E. COLLINS, JR., has been appointed manager of the Seattle district, explosives sales for the Atlas Powder Co., Wilmington, Del. Mr. Collins, who returned to the company recently after over two years in the Navy, has gone to Seattle as assistant manager. He joined Atlas in 1928 as an explosives salesman in Pennsylvania. He succeeds W. T. Mahood who will be with the San Francisco district sales office.

JAMES HOLAN, founder, 37 years ago, and president of the American Coach and Body Co., Cleveland, Ohio, has been made chairman of the board, and treasurer. Allen T. Greiner, who recently resigned as general manager of the Salem Engineering Co., Salem, Ohio, will become president and a director. C. A. Witter, president of Provident Engineering Co., Philadelphia, was elected a director, and William R. Baxter was named plant manager. Herbert F. Wagner becomes controller and assistant treasurer, with John Kral, assistant.

THE LONE STAR CEMENT CORP. has announced the appointment of Purd B. Wright, Jr., as manager of the Incor division and technical service; Ernest Gruenwald as chief engineer, technical service; and James F. Callery as manager of the publicity department.

JAMES H. TILLER, JR., formerly southern district manager for Barber-Greene Co., and more recently colonel in the Corps of Engineers, has been appointed manager of the Phoenix, Ariz., office of the Brown-Bevis Equipment Co.

E. W. SMITH, vice president in charge of sales for the Philip Carey Mfg. Co., has been elected chairman of the board of governors of the Asphalt Roofing Industry Bureau. He succeeds Herbert Abraham, president of the Ruberoid Co., of New York City.

THE HI-WAY SERVICE CORP. has changed its name to the Drott Mfg. Corp., 5141 No. 35th St., Milwaukee, Wis. The new corporation title will more readily identify equipment with the manufacturer.

WILLIAM A. MARSTELLER has been appointed general advertising manager of Rockwell Mfg. Co., Pittsburgh, Pa. Mr. Marsteller has been vice president in charge of sales, advertising and industrial relations for Edward Valves, Inc., a subsidiary of the Rockwell company.

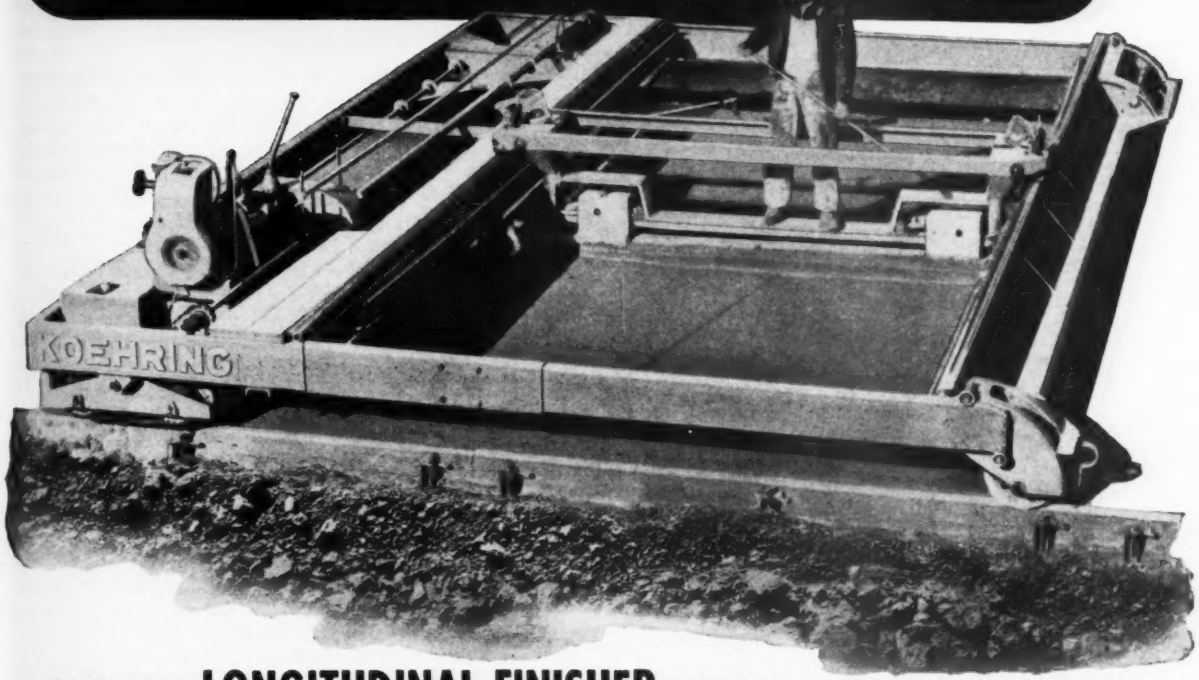
SARCO CO., INC., New York City, makers of steam traps, temperature control and heating specialties, has announced the opening of a new office in Washington, D. C. Maj. H. F. Collins, formerly of the Corps of Engineers, is in charge.

EDWARD E. WORRELL has been appointed assistant district manager of the central district for Lima Locomotive Works, Inc., Shovel and Crane Division, Lima, Ohio.

COMMANDER BURT POWELL, former news editor of Caterpillar Tractor Co., has returned to the company as a member of the sales department following 4½ years of service in the U. S. Navy.

TO SERVICE enlarged demands and broaden distribution of its materials to the construction industry, Owens-Corning Fibreglas Corp. has completed arrangements with the Flintkote Co. and the Armstrong Cork Co. to distribute Fibreglas building insulating through the national sales outlets of those companies.

IS OBSOLETE HAND BULL FLOATING HOLDING BACK YOUR PAVER?



KOEHRING LONGITUDINAL FINISHER KEEPS UP WITH ANY PAVER PACE

Can you afford to hold back your paver simply because the hand finishing crew can't keep up? When, with a Koehring Longitudinal Finisher on the job, you might be laying all the concrete your paver can produce? Yes, the Koehring Longitudinal Finisher keeps right up with any paver — and offers other important advantages as well.

FINISHES WHEN SURFACE IS READY

Only the Koehring Longitudinal Finisher can finish some surfaces at the exact time when finishing should occur—after the surplus water has risen to the surface, when the concrete will no longer bleed after it has received its final finish. Hand bull floating often cannot touch harsh concrete at this stage.

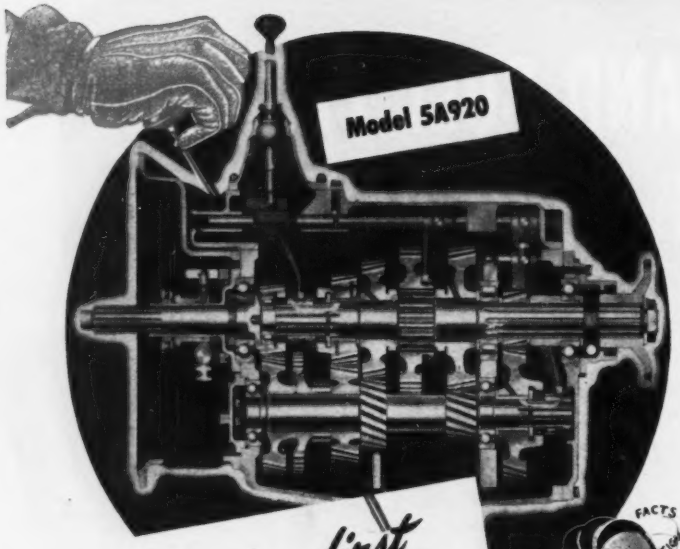
EXACT COMPLIANCE WITH SPECIFICATIONS

Surfaces finished by the Koehring Longitudinal Finisher are smoother riding, wear better, because crowns are finished exactly as specified. Savings on finishing labor costs often run high.

KOEHRING COMPANY • *Milwaukee 10, Wisconsin*

KOEHRING K HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT



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for proved performance

"A single feature proved *in the field* is worth a dozen proved *on the boards.*" This fundamental axiom has always been a cardinal point in Fuller's engineering and development policy . . . an important point to remember in the selection of transmissions for your newly designed trucks. With Fuller, not only the basic design of every product, but also every *detail* of design and construction is fully tested in the field *before* it is put into production. Through this program of practical testing, Fuller engineers work out refinements that insure longer work-life and more efficient performance of the entire transmission. This policy of backing up engineering theories with rigorous field testing is your best assurance of *proved performance* . . . when you specify Fuller Transmissions!

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Manufacturers' Publications

Correct Lubrication—A 12-page illustrated booklet tells the whole story of correct lubrication in the construction industry, the theme being that such lubrication improves performance, lowers cost of maintenance and increases production, and the booklet points out that the right type and grade of oil or grease for every bearing should be chosen, and that the use of efficient lubrication tools eliminates waste and contamination, and reduces "down-time" for lubrication.—*Alemite Division, Stewart Warner Corp., 2750 Wolcott Ave., Chicago, Ill.*

Steel Fabricating—A pocket-size booklet explains the functions of a national organization representing the structural steel fabricating industry of the United States.—*American Institute of Steel Construction,* 101 *Park Ave., New York, N. Y.*

Spudders—Describing a new spudder, a colorfully-illustrated 8-page bulletin carries large photographic reproductions of the entire machine as well as close-ups of machinery and construction. Emphasized in the bulletin are the design features which, the manufacturer asserts, make the spudder "ideal for top-to-bottom drilling to 2500 feet, servicing to greater depths." Principal advantages claimed are easy mobility, quick rigging up and tearing down, snappy spudding action, instant responsive control, and versatility.—*Bucyrus-Erie Co., South Milwaukee, Wis.*

Multiport Relief Valve—A new publication tells the numerous applications of this valve in relief of steam, air, gas, gasoline and oil vapors, water, etc. Adaptability to other services is cited. Of special interest are revised sizing data on relief valves which include capacity and pressure rise tables convenient for size selection.—*Cochrane Corp., Philadelphia* 32, *Pa.*

Asphalt Flooring—A folder tells about an industrial asphalt flooring used as a surfacing for floors and to patch old floors. It is applied cold and in said to be 50 to 60 percent lighter than applications of "hot mastics" designed to bear comparable loads. It is claimed that a one-half in. layer will withstand loads up to five tons and will outwear concrete.—*Philip Carey Mfg. Co., Lockland, Ohio.*

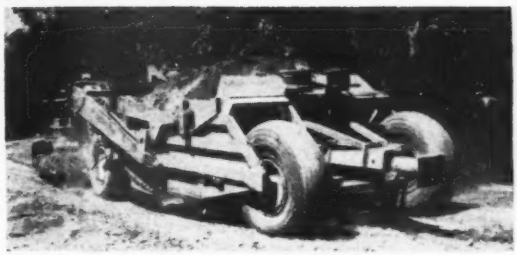
Fence Erection Handbook—As an aid to contractors, fence superintendents and

Yards ahead in Performance

. . . because they are years ahead in practical engineering features . . .

On job after job, you'll find the new LPC "Carrimors" outperforming other scrapers by a wide margin. They're getting bigger loads faster and with less power because every LPC feature — cutting edge, heel clearance, bowl design, hoist sheaves and apron operation — has been scientifically engineered to insure easy loading.

Regardless of the kind or condition of material, LaPlant-Choate's *exclusive* positive forced ejection gets the load out quickly and completely. Even rocks, stumps and sticky gumbo can't ever jam between the gate and apron. Moreover, the rear gate is positively returned *the full distance* every time by the weight of the apron, plus a special spring arrangement. So for lowest possible costs tomorrow, get complete facts today on the new LPC "Carrimors." LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; 1022 77th Avenue, Oakland 3. Calif.



● Low center of gravity, low over-all height and freedom from unnecessary dead weight also contribute to LPC's record of "lowest possible cost per yard."

The New 8 and 14 Yard LPC *Carrimors**

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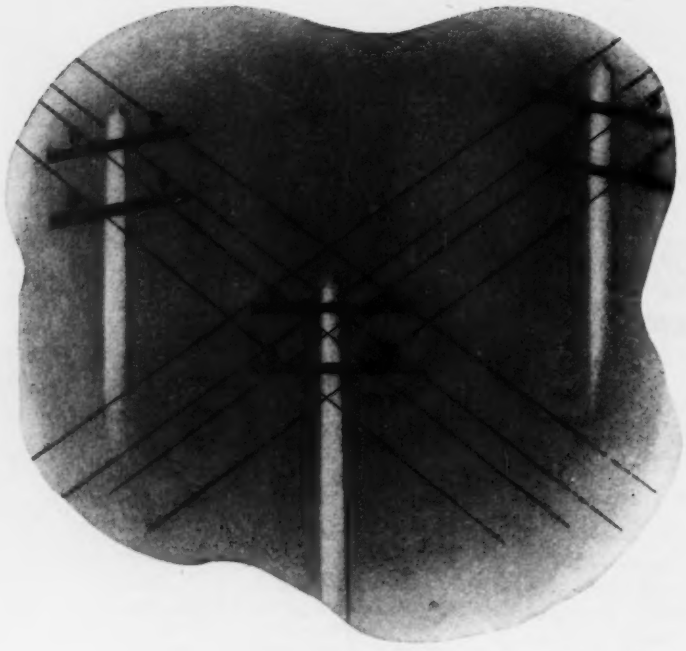

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In this case, wires cross and recross to form an intricate pattern . . through the architect's study . . back to the engineer's conference . . over the property owner's desk . . out to a contractor's bid. The versatility and flexibility needed by a great construction job demand much of many men. With more than 30 years' construction experience . . over a thousand projects and hundreds of millions of dollars of construction "know-how" . . we are prepared to meet the responsibilities imposed by the most difficult jobs. Our constant, careful direction produces results *on or before schedule*. We sincerely hope you will cross your wires with ours—soon.

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others responsible for the installation and maintenance of chain link fence, this new manual gives complete instruction covering all points in the erection of this type of steel fence.—*Wickwire Spencer Steel, 500 Fifth Avenue, New York 18, N. Y.*

Home Insulation—A booklet giving home-owners and builders a practical understanding of mineral wool insulation, its uses, forms, methods of installation, heat and fire-resistant properties, endurance, etc., is available. As a handbook it provides yardsticks developed by consulting engineers to determine relative comfort and economy rating, and savings in fuel costs achieved by various thicknesses of insulation. It describes the characteristics and features of mineral wool, and where and how to use it for insulation, whether in batt, wool, or granulated form. — *National Mineral Wool Association, 1270 Avenue of the Americas, New York 20, N. Y.*

Fastener Installation—A booklet describes a new installation procedure which is said to reduce by fifty percent the time required to install fastener studs. Use of a newly developed grommet eliminates the separate operations formerly required for inserting, setting and clinching the grommet. In addition to achieving marked savings in time costs, the quicker, simpler installation procedure is said greatly to facilitate the use of fasteners in mass production operations. It also simplifies the replacement of fastener studs in the field when necessary. The booklet contains descriptions of the function of various types of fasteners and shows many typical applications. — *Dzus Fastener Co., Inc., Babylon, N. Y.*

Dozer-Shovel—A 24-page bulletin describing a dozer-shovel is colorfully illustrated with large photographs and pen drawings. It depicts actual operating conditions on a wide variety of digging, earthmoving, and material-handling jobs. Advantages claimed are: Low overhead clearance and generally compact design for high maneuverability; high visibility; maintenance of tractor balance; smooth hydraulic control, and easy interchangeability from shovel to bulldozer and vice versa.—*Bucyrus-Erie Co., South Milwaukee.*

pH Control Equipment—A bulletin describes continuous pH controllers and recorders including electrode assemblies and accessories. The bulletin includes engineering and technical information relative to pH theory and measurement. A variety of actual installations are described, with chart records, photographs, and flow diagrams included.—*The Bristol Co., Waterbury 91, Conn.*